

Does Matter Matter? Should We Mind the Mind? —Can Philosophy Be Reduced to Neurophysiology?

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Abstract

The neural network in the human brain underlies the conceptual network in the mind. Sensations and primary and secondary concepts in the conceptual network correspond to integrative structures and lower- and higher-level associative structures in the neural network, respectively. Both networks co-evolve during biological evolution (phylogenesis) and individual development (ontogenesis). Subjective psyche and (self-) consciousness emerge when the cognitive center in the human brain becomes recurrently directed on itself (receives signals from itself, forms its own representation within itself). Matter (external world) corresponds to the region of the neural (conceptual) network that is not directed on itself, while the mind (self-consciousness) corresponds to the region of the neural (conceptual) network that is directed on itself. The very sharp separation/opposition within our psyche of the external world (physical reality) and internal world (content of our consciousness) results from the special kind of functional complexity of the human brain. We have only a very vague idea about what is “out there” in the “real” external world, as we have direct access only to our conceptual network. Matter does not matter and we should not mind the mind as much as we usually do. Generally, all of the main philosophical problems can essentially be reduced to human neurophysiology.

Keywords

Matter, Self-Consciousness, System Complexity, Neural Network, Conceptual Network, Cognitive Science, Neurophysiology, Mind-Body Problem, Psyche, Emergent Phenomena

1. Introduction

The mind-body problem is perhaps the most important problem of philosophy, and perhaps even of human thought in general. However, this problem is usually

formulated in such a way that it concerns the relation between the mind (subjective psyche, self-consciousness, internal world) and matter (the brain, physical reality, and external world). Nevertheless, we do not have direct access to the latter, but only to the content of our psyche, the “substance” of which is what I call the conceptual network (Korzeniewski, 2010, 2013a, 2013b, 2014, 2015b). The conceptual network constitutes an epiphenomenon (result of supervenience) or functional aspect (or simply a “by-product”) of the neural network in the human brain, the result of a certain specific kind of dynamic complexity of the latter. It is in turn composed of particular, better or worse specified, separated concepts that mean by connotation, that is, by relation to each other. The conceptual network is in fact everything we really have at our disposal and possess direct access to. We can only guess, speculate or, at best, extrapolate what *noumena* (things in themselves) (Kant, 1999) look like and in fact we must assume that they exist at all “out there”, outside our mind. We will never know their “true” nature, as the substance and structure of the conceptual network are completely different from the substance and structure of (particular components of) the physical reality (Korzeniewski, 2010, 2013b, 2014, 2015a, 2015b). Of course, there must exist some crude correspondence between *phenomena* (and the structure of the neural network underlying them) and *noumena*, otherwise we would not survive as a biological species and would not have such spectacular achievements in pure science, technology, and medicine. However, we will never exactly know what the nature of this correspondence is. We are by no means universal cognitive machines. Therefore, perhaps a more reasonable question than: “What is the relation between psyche and matter?” is the question: “What is the relation between the representation of psyche and matter in our conceptual network?” Or: “Can such a sharp opposition of the mind and the body (matter) in our cognition result directly from human neurophysiology, form the way the human brain integrates and processes signals?” I will argue in this article that the answer to the last question is at least partly positive, and therefore the contrast and extreme dissimilarity between these phenomena are to some extent apparent. In other words, the opposition between matter and mind does not matter so much and we should not mind it as much as we usually do.

The psychical consciousness, constituting a completely new quality, ought to be distinguished from the instrumental consciousness that is a representation of something (an “object”) within something else (a “subject”). A bacterium can be instrumentally conscious of the presence of sugar lactose in its surroundings (Jacob & Monod, 1961), the thermostat in a fridge—of temperature, a video camera—of a given dynamic picture, while a frog—of an insect flying by. On the other hand, the true, psychical consciousness alone does not exist without self-consciousness (it does not even make any sense). In other words, the (psychical) consciousness appears together with self-consciousness and constitutes a part, or an aspect of it (see: Korzeniewski, 2010, for detailed discussion). Therefore, in the present work, both consciousness and self-consciousness are frequently referred to as (self-) consciousness.

2. Conceptual Network and Neural Network

The idea of conceptual network and its relation to the neural network has been discussed extensively before (Korzeniewski, 2010, 2014, 2015b). Here, it will be shortly summarized. According to this idea, a concept is a certain unit of meaning or sense. Everything that reaches our consciousness (psyche) and constitutes its content is either a concept or a complex of concepts. Therefore, a “concept” can be considered as a “unit” of consciousness in general, and of thought in particular. For this reason, I postulate something that can be called a conception of “conceptual thinking” (Korzeniewski, 2010, 2013b, 2014, 2015b), in opposition to Wittgenstein’s “linguistic thinking” (Wittgenstein, 1921). A concept comprises all kinds of beings that can be perceived, thought, imagined, or grasped mentally in reality, dream, or in mystical, religious, or narcotic trance by a conscious brain. A stone, Albert Einstein, a category, a devil, pleasure, justice—as well as many phenomena so misty and undetermined that they do not have linguistic names attributed to them—all of them are concepts. Concepts are not only “individual beings”, as for instance linguistic names in a sentence, but also more complex objects, corresponding to entire sentences, conceptions, and ideas.

The *conceptual network* is defined as a complex of concepts that are mutually interconnected by certain determined relations and exhibit some specific properties that fills our consciousness (Korzeniewski, 2014). Concepts in the conceptual network pass smoothly into other concepts and are not separated by any sharp borderlines. To some extent they resemble hills in a landscape—although we can separate (distinguish) particular hills, there are no sharp limits between them. The conceptual network is a continuous formation, contrary to language, which is composed of discrete names. The identity of a given concept is a derivative of two properties. The first property is the degree of separation of the sense of a concept, its determination and specification, “intensity” of its meaning in the “semantic field”. It determines how many concepts “define” a given concept and decides how clearly and intensely a given concept appears to our consciousness, how obvious and univocal it seems to be. The second property that characterizes and differentiates concepts is the complex of connections between a given concept and other concepts in the conceptual network. It determines to which concepts and in which way a given concept is related semantically, which other concepts “define” this concept. This property specifies the *meaning* of a given concept. The meaning of a concept is determined only and exclusively by its semantic context and its reference to other concepts, and therefore concepts mean by *connotation*, contrary to a meaning by denotation, where concepts would mean by direct correspondence between them and the objects designated by them. The concepts that “define” a given concept are in turn themselves defined by other concepts. Ultimately, all concepts are defined by all other concepts. The proper semantic context for a given concept is constituted by the whole conceptual network.

We can define the semantic space with its “dimensions” represented by “significant axes” that fix a sort of a Cartesian system of coordinates. In such a

space concepts are formed by polarization along significative axes in relation (reference) to other concepts. Examples of simple significative axes are: big—small, fast—slow, pleasant—unpleasant, blue—not blue. Significative axes, like concepts, are continuous objects. This refers to the differences both “along” an axis between its “ends”, and the differences “between axes”, separating one axis from another. Also, the type of polarization (opposed ends of axes) for a given axis is determined by appropriate concepts. In other words, concepts are determined by significative axes, while significative axes—by concepts. This fact constitutes another manifestation of the connotativity property of the conceptual network. Within this network, senses appear at the moment of “layering” or polarization of a “semantic vacuum” along significative axes.

Sensations are equivalent to a direct “activation” of some already formed concepts in the conceptual network by stimuli from the external world (integrated by integrative neural structures in the sensory brain cortex). This activation can be enhanced by the phenomenon of attention. The existing conceptual network enables understanding of incoming signals, constitutes a reference frame for their interpretation. On the other hand, stimuli from the external world participate in the formation of new concepts, further determination of the existing concepts and development of the entire conceptual network. Already formed concepts can also be activated “indirectly”, by the autonomous processes of thinking, remembering, dreaming, that is generally by endogenous autonomous activity of the brain. The current content of our (self-) consciousness is constituted by the concepts that are just “activated” and from which recurrent signals are received by the cognitive center in the brain (see below). Incoming sensations are related to the existing concepts (and thus “interpreted” and “understood”), adequately processed and possibly incorporated into the conceptual network as new concepts. Particular concepts are activated much stronger by sensory stimuli from the external world than by autonomous processes of thinking, recalling and remembering in the brain. For this reason, we perceive sensations as much clearer and “real” than thoughts, dreams, and recollections. Nothing like “pure sensations” or “qualia” (Chalmers, 1997) exists or even has any sense (see below). The signals coming from the external world (incoming “sensory pictures”) mean anything only because they are referred to and interpreted by the already existing conceptual network that entirely determines the “mental content” and “quality” of perceived sensations.

The discrete, denotative language can be opposed to the continuous, connotative conceptual network, although at a deeper layer language constitutes a part of this network (it is built of concepts, which lie at the base of linguistic names and their meaning) (Korzeniewski, 2010, 2013b, 2014, 2015a, 2015b). Clearly-separated (discrete) names in language correspond to the most distinguished, univocal and determined (specified) concepts in the conceptual network. Misty, vague, scarcely palpable, and difficult to interpret concepts do not have their counterparts in the linguistic layer. For this reason, the conceptual network is a phenomenon more general and more primeval than language. Therefore, just

concepts and not linguistic names and sentences constitute the content of our consciousness. Language fulfils two main functions: external and internal. The external function is the communication between two (or more) psyches, two conceptual networks. The internal function is a very efficient operation (manipulation) with the whole conceptual network and thus enhancement of the very process of thinking. This fact led to conceptions of “linguistic thinking” (Wittgenstein, 1921). Anyway, a highly developed symbolic language is most probably necessary for origination of higher forms of thinking and (self-) consciousness. Nevertheless, this is the complex of concepts that is the fundamental “substance” of psychic processes.

At a given moment only a very small fragment of the conceptual network is “activated” and therefore can constitute the “substance” of our (self-) consciousness (there are also unconscious processes of thinking that are not at a given moment a part of the neural/conceptual network that is directed on itself, see below). However, the meaning/understanding of any concept activated at a moment is ultimately based on the entire network. The conceptual network contains better or worse differentiated and internally coherent areas. There belong to them hierarchically-organized scientific disciplines, religions, worldview, fine arts, literature, ethics, and the sphere of common (ordinary) concepts.

At the moment of birth, we had almost no concepts at our disposal. Our knowledge about the world grew during our life, our view of the world developed, and our understanding of different aspects of reality, products of culture, science, and art increased. The meaning of “the same” linguistic names changed and developed. Generally, our conceptual network had to evolve during individual (ontogenetic) development. Our species *Homo sapiens* originated in the course of biological evolution from animal ancestors that had much less complex neural systems and brains, and were devoid of (self-) consciousness. Therefore, (self-) consciousness, together with the underlying neural/conceptual network, had to develop during biological evolution. Finally, the set of human minds (psyches) created culture, science, and religion, which in turn had a great impact on formation of particular minds (psyches) themselves. For this reason, the evolution of the (collective) conceptual network of culture had to proceed in parallel with the evolution of civilization.

The conceptual network is an epiphenomenon (result of supervenience), an aspect or, if somebody prefers, a by-product of the activity of the (properly organized) neural network in the brain. The functional unit of the brain is constituted by a neural cell (neuron), which is functionally connected with other neural cells (as well as with receptor cells and effector/motor cells). Together, they form a (broadly understood) neural network. The activity of a single neuron within this network consists in perceiving stimuli (impulses) from other neurons through appendages called dendrites, processing these stimuli with the participation of information already possessed by a neuron (memory), and a possible (optional) transfer of a signal of an appropriate intensity (impulse frequency) to other neurons through an appendage called axon. The axon of one neuron is

connected to dendrites or the cell body of other neurons through synapses. Neural signals can be stimulatory or inhibitory. Obviously, different neurons differ one from another, as they fulfill different roles and enter the composition of various neural routes, circuits, and centers in the brain. There exist two (functional) categories of such differences.

The internal differences result from the fact that each neuron has a characteristic complex logical function, which transforms the signals reaching the neuron into signals that are sent to other neurons. The input set (combination) of signals is equivalent to the set of stimulated dendrites as well the strength and time sequence of stimulation, while the response at the output is equivalent to the fact whether or not a signal is sent further by the axon and how intensive it is (what is the frequency of action potential spikes or neuron firing). The output signal intensity is a derivative of the combination of input signals intensities and the time they reach the target neuron. The pattern of response to incoming signals is specific for a given neuron. The response of a particular neuron, and all the more of a complex of neurons, to a given set of stimuli is not given for ever, as it can be modified by past (sets of) stimulations (experiences) of the neuron in the process of learning (memory formation).

The “carriers” of memory are single synapses, particular neurons and their complexes. Acquiring of memory consists in the formation of new connections and/or selection of the existing connections (synapses) between axons and dendrites (or cell bodies), in modification of the “weights” of synaptic connections¹, or in production of appropriate proteins in the neuron body.

The second-type, external differences between neurons consist in the fact with which other neurons a given neuron is connected, and in what (functional) way. The connections via synapses between the ends of axon ramifications of a given neuron (complex of neurons) and the ends of dendrite ramifications (or cell bodies) of other neurons (complexes of neurons) determine the “meaning” of a given neuron (complex of neurons) in the functional “context” of the neural network. Therefore, neurons “mean” by *connotation*. Most probably, the such-and-not-another set of functional connections (comprising also the synaptic weights or stimulation thresholds) is unique for a given neuron: only one neuron in the whole brain is connected to exactly these-and-not-other neurons (neuron complexes) in the exactly such-and-not-another way (in the functional sense).

Therefore, the functional identity of a given neuron as an element of the neural network results from its internal and external specificity: the internal “logical structure” that “translates” the input signals into the output signals and the external functional “localization” within the neural network. The first is related to a local memory; the second—to the global memory (dispersed ultimately throughout the *entire* neural network). Both the first (internal), and especially the second (external) sort of information and memory “contained” by a given

¹The weight of a given synaptic connection is inversely proportional to the signal intensity that is necessary to stimulate this synapse, that is to its stimulation threshold. Neurons as well as neural routes, circuits and objects that contain numerous synapses with low stimulation thresholds can be easily activated by relatively weak/fragmentary signals.

neuron (complex of neurons) cannot be preserved after destruction of the structure of the neural network, and therefore recorded and transferred genetically. For this reason, only the general structure of single neurons and neural networks (and the entire nervous system) as well their predispositions to form and modify connections can be inherited. The detailed structure of complex neural networks, especially those underlying the subjective psyche and (self-) consciousness, must *evolve* during individual development through the acquisition of new experiences and accumulation of memory based on formation/ elimination/modification of (the weight of) synaptic connections.

A neuron is connected to other neurons through its dendrites (inputs) and axon (output). It can also receive impulses from receptor cells that react to stimuli from an environment (e.g., chemical, auditory, visual stimuli) and send signals to effector cells (especially muscle fibers). Only the whole complex of neurons, receptors and effectors forms a closed functional system, within which neural signals are transferred and which constitutes the material “base” or aspect of the conceptual network (Korzeniewski, 2010, 2013a, 2014, 2015b).

3. Evolution of Conceptual Network

3.1. Individual Development (Ontogenesis)

The structure of complex neural networks, including those underlying the conceptual network, cannot be inherited, as the genetic record can concern a general (potential) functional structure of a neuron and the whole nervous system, but not a particular complex network of synaptic connections that is formed and modified during individual development. The amount of information contained in the brain of an adult human greatly exceeds the amount of genetic information contained in human chromosomes.

Of course, some aspects of the neural network are inherited. In primitive animals, most of their dynamic structure of the neural network is determined by the genome. In man, the following functional aspects are encoded genetically: the manner of integration of the data coming from receptors (e.g., their ordering in functional structures which we interpret afterwards, *ex post*, as spatial, temporal, or causal relations), organization of the centers of the brain responsible for vegetative functions (breathing, heart beating, regulation of metabolism and body temperature etc.), and also *predispositions* of neural cells and the neural networks composed of them to a selective formation and removal of connections, as well as to acquisition of memory. However, the neural network responsible for a complicated system of data processing, thinking, planning, decision making, and behaviors, being the background of our memory and (self-) consciousness, is formed during an individual development in the process of learning.

Of course, the evolution of the conceptual network in the individual (ontogenetic) development of man is parallel to (constitutes an aspect of) the evolution of the neural network underlying it. The latter consists of the formation of new neural connections (appendages and synapses), the decay of a part of the existing connections, the change of the “weight” of existing synaptic connections, the

biochemical record of memory, the origination of impulses circulating in neural circuits, the selection of existing circuits, and perhaps of other, yet unknown processes. All these processes occur in the brain, the general plan of the structure and function of which is encoded genetically.

At the moment of birth, essentially no conceptual network is present. However, a man is endowed with germs for its development, centers of crystallization of this network. There exist primitive “significative axes”, determined by purely biological meanings or “values”, for instance: “warmth-cold”, “satiety-hunger”, “feeling of safety—lack of it”. Appropriate centers in the brain of a nursling receive signals from adequate receptors (and other centers) and inform about the state of affairs the primeval “evaluating system”—the center of pleasure², stimulating this center or not, depending on the situation (the fulfillment of basic biological needs³) (see Korzeniewski, 2010). The above-mentioned axes differentiate stimuli arriving from the surroundings and segregate them into various categories, being the germs of first concepts. The segregation and differentiation occur *in relation to* already existing significative axes. In turn, the originating concepts form the basis of new semantic axes.

The existing significative axes constitute an interpreter for stimuli coming from receptors⁴. Stimuli from the environment received by sensory organs are only a bunch of unordered signals that have no sense until an interpretative key or algorithm is applied to them. Most animals have genetically encoded many, if not all, algorithms decoding sensory stimuli. In man, these genetic predispositions concern lower-level integration of stimuli and extraction of features and elements of sensations (e.g., spots, lines, shapes, colors, movement in the case of visual stimuli) from them that occur in appropriate centers in the sensory cortex. They constitute the semantic germ, the center of crystallization of senses composed of a few significative axes. The primeval complex of concepts/significative axes is afterwards developed during experience accumulation. The origination of concepts and their attribution to the phenomena of the external world occur by induction, through a multiple coincidence of similar sets of stimuli. When a given complex of stimuli brings about the same effect many times, and enters the same interactions with the existing conceptual network, it becomes incorporated into this network as a new concept. Therefore, the sensations from the external world are the “substrate” for newly built concepts. These sensations are initially confronted with the primary significative axes, and afterwards with the already possessed conceptual network, to which they are “referred”. In this way, the meaning of new concepts is determined and defined by the already existing

²Which can be identified more or less with the reward system in the brain, in which the neurotransmitter dopamine plays the main role.

³In adult humans, the reward system can also be stimulated by satisfying of non-biological needs, for instance cognitive, ethical, or aesthetical needs, although they could nevertheless have biological roots (in fact, this is quite trivial, as we evolved from purely biological creatures). This testifies to the thesis that humans have achieved a level that is higher than the purely biological level, namely the psychic and cultural level. Therefore, I do not agree with the protagonists of an extreme form of sociobiology.

⁴These signals undergo preliminary integration by appropriate centers in the sensory cortex in the brain.

complex of meanings contained in the conceptual network.

As the conceptual network develops, there originate new, secondary significative axes based on the already existing concepts. Subsequent (processed) complexes of stimuli are located as new concepts in the network in relation to the existing concepts. In this way, projections (images) of individual, “real” objects (aspects, facts) of the external world are created in the conceptual network. Such concepts, directly corresponding to simple “facts” of reality, will be referred to as “primary concepts” (Korzeniewski, 2010). The general, abstract secondary concepts are created (in a sense on a higher level) similarly to the primary concepts, based on a “perception” by the mind of many similar sets of concepts that are particular in relation to them (these can be both primary concepts as well as secondary concepts, lower in the “hierarchy of generality”) and of autonomous processes of thinking (e.g., finding repeating patterns in primary concepts) (Korzeniewski, 2010).

A newborn child has at its disposal the simplest significative axes of a purely biological meaning. Now, if the voice, smell, and touch of the mother is associated by an induction (multiple coincidence of stimuli) with warmth, satisfying of hunger, and feeling of safety (for instance, because the first regularly heard voice in its life is associated by a newborn child with a feeling of safety), then, such a combination of auditory, gustatory (milk), aromatic, and tactile stimuli will become a germ of the concept “mother”.

As experiences accumulate, the concept of a mother is enriched with new elements, supplemented by visual stimuli, related to other concepts, made more precise. It should be emphasized that “the same” concept “mother” differs in a newborn child very significantly from this concept in an adult person. The “center of crystallization” of first concepts is impulses: satiety, safety, and cognitive. The latter makes a germ of the concept “toy” from an attractive (e.g., colorful) object yielding to manipulation. In a newborn child, the conceptual network is very poor—these few concepts fill its entire world. At the very beginning, there are maybe only two concepts: “mother” and “lack of mother”. Afterwards, when still new stimuli are perceived, these concepts undergo differentiation (“splitting”) into many derived concepts, for example “mother” divides into “true mother”, “nanny”, “father”, and so on, as the baby starts to distinguish particular persons satisfying its hunger and need for safety. This sounds a little grotesque, as the use of linguistic names to describe these hardly-formed concepts is not quite legitimate. Linguistic names correspond normally to concepts that are best determined, separated, attributed with the highest intensity of the “semantic field”. Additionally, when discussing the psyche of a newborn child, one goes introspectively back to times when he/she did not yet possess language.

A strict description of the development of the psyche of a newborn child is not possible at least because of the very weak congruence between originating germs of concepts and the sphere of language. For this reason, general principles rather than accurate account of facts were presented above. The general properties of the conceptual network development are: “stratification” of the existing concepts

into more detailed concepts, location of new concepts in the conceptual network by induction, that is multiple perceptions of sensations or more detailed concepts, and specification of already existing concepts. These processes are strictly connected with each other and in fact constitute various manifestations of the same process. As the meaning of concepts within the conceptual network is realized by connotation, each concept in this network is “defined”, more or less directly, by all other concepts. The incorporation of new concepts into the network results therefore in better specification of the already existing concepts. The “stratification” of hitherto uniform concepts proceeds because of the appearance of new semantic axes. The appearance of such axes is equivalent to the appearance of new meanings, and therefore new concepts. Already existing concepts are referred to these new axes, which results in their better specification (determination).

The set of reactions of a baby, its repertoire of behavior is as poor as its representation of the world determined by the possessed network of concepts. It can be said that a baby is able to manifest one of two states at the output. Either it does nothing, when all its needs are satisfied, or reacts with a scream, when it feels hunger, is wet, or feels the mother’s absence and the corresponding feeling of lack of safety. The choice of one of these states depends on the stimulation of the primeval “evaluating factor”, i.e., the center of pleasure (reward system in the brain). The evolutions of the degree of complication of the perceptual system, of the picture of the world (conceptual network) as well as of the system of behaviors, proceed in parallel during ontogenetic development. In particular, both the ability of perceiving various aspects of the world and of reacting adequately requires the possibility of their recognition, interpretation, and “understanding” (both in the biological and psychological sense) based on the possessed conceptual network.

The first main aspect of the evolution of the conceptual network during the ontogenetic development is certainly its quantitative increase, associated with the origination of new concepts and specification of the already existing ones. The development of the conceptual network does not start from a complete semantic emptiness, as some meanings have to fix the sense of the newly created concepts. However, the germ of psyche constituted by the few inborn, biological significative axes and by primary integrative structures is very small in comparison with the conceptual network of an adult man.

At the moment of birth a baby is suddenly exposed to a plethora of signals coming from the external world. An embryo in the mother’s uterus, connected to her circulation of blood by an umbilical cord and wrapped in the placenta, practically does not receive any stimuli⁵ from the environment, and therefore is devoid of the “substrate” for the formation of concepts.

The conceptual network that is practically absent from a newborn child should be clearly separated from the inborn “significative axes”, and the me-

⁵Some exception seems to be e.g., the beating of the mother’s heart or sounds from outside the mother’s body. However, the degree of diversity and complication of such “stimuli” is very small in comparison with the richness of sensations received after the birth.

chanisms that integrate stimuli into spatial, temporal, causal, etc., structures. The former is already a representation of the external world, although very poor at the beginning, while the latter is a set of predispositions, a frame for the formation of the picture of this world.

In a sense, the external world (at least some of its aspects) is in some way “imprinted” in the cognitive mechanisms of our brains. The process of imprinting was performed by biological evolution, “responsible”, after all, for the possibly most efficient functioning of living organisms in the physical, biological (comprising relations with other organisms) and social (comprising relations with individuals of the same species from the same society/tribe) reality. However, such an inborn record must still undergo realization. In the process of the development of the conceptual network it means formation of this network from the “substance” of incoming sensations. Of course, sensory stimuli are also of physical character, but their perception at the neuro-psychical level is completely different (because of the degree of complexity of the structure of sensations) from the “perception” of physicochemical properties of the surroundings at the biochemical and physical levels of functioning of living organisms (or from the “perception” of the picture of the external world by a video camera). The conceptual network forms its “substance” from incoming sensations, and for this purpose it uses some algorithms in the form of inborn mechanisms of stimuli integration. Nevertheless, only the simplest and most general instructions for the development of the conceptual network are inborn (as primary significative axes and primary integrative structures). The rest originates gradually as a part of this network, determining the frame for the directions and character of its further development. Generally, sensations are necessary for the conceptual network to originate and develop, as it is “built of” these sensations to a great degree.

The appearance of some “surplus” in relation to a purely “immediate”, “sensory” presentation of the world is the second aspect of the ontogenetic development of the conceptual network. While primary concepts are simple derivatives of processing of the stimuli reaching our sensory organs, secondary (general, abstractive) concepts originate based on primary concepts or other secondary concepts, and therefore their connection with the external world is more indirect, which means, at least potentially, less restricted. Therefore, secondary concepts can be separated from the real world (e.g., the concept “angel” or “prophecy”), although they do not have to. This surplus in the conceptual network is inseparably connected to processes of thinking that is to the autonomous dynamics, the activity of the neural system. Just this activity—related to the integration, association, and coordination of data from receptors, memory records, and signals sent to effectors—leads to the origination of secondary concepts.

Essentially the entire conceptual network is acquired during individual development of a man and therefore it has to be formed in the process of learning. The development of the conceptual network through gathering experience constitutes the third aspect of its evolution during ontogenesis. One can learn in many ways: by observation, by trial and error, by imitation, or through the med-

iation of linguistic transmission, oral or written. The accessibility of particular ways of learning to a man depends on the degree of development of his/her conceptual network. A baby, who possesses only its germinal form, is capable only of passive observation of the surrounding reality. Elements of this reality gradually acquire different meaning for the baby, depending on their connection with the fulfillment of purely biological needs (hunger, safety etc.). Having acquired some orientation in the external world, it is possible to experiment with it, for instance to move oneself in it or move various objects. This helps to develop the spatial representation of the world and to learn its properties. Learning by the trial-and-error method is in fact a method of active perception, where a baby “observes” its own, initially purely accidental actions, and the reaction of the world to them. Gaining knowledge by imitation of parents or other adult people already requires some understanding of the properties of the world, and therefore, it requires a relatively well-developed conceptual network.

Mastering of a system of artificial symbols, that is an ethnic language, greatly increases the efficiency of the processes of learning. It constitutes the fourth aspect of the evolution of the conceptual network during ontogenesis. The language, itself a part of the conceptual network in a human mind, greatly improves the use of this network. Linguistic names help to “identify” concepts. The rules of syntax are useful in their appropriate ordering. Language, as a common social convention, allows for the mutual “translation” of conceptual networks of different individuals. New pieces of information are located in the existing semantic and syntactic structures of language (and thus, of the conceptual network underlying it), and therefore the learning by trial and error is no longer necessary. This greatly accelerates the process of learning and development of the conceptual network. An additional advantage of language is of course the fact that it allows to transfer information at a distance, both in time and in space.

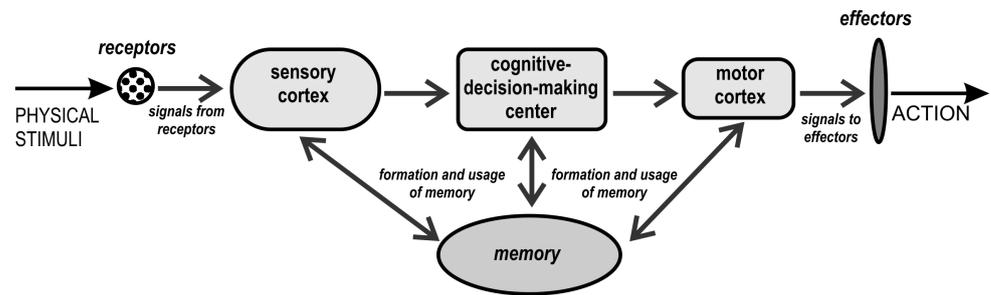
A given language not only stimulates the development of the conceptual network and the picture of the world contained in it, but also shapes and distorts this picture in some way through its structure (Sapir, 1921; Whorf, 1940; see also discussion in Korzeniewski, 2013b). The structure of the world is unique, while each language has a slightly (or significantly) different structure. The structure of language orders the conceptual network in a given concrete way, and therefore the representation of the world formed within it. There are known languages that do not contain verbs in the common ordinary sense (Gil, 2013), and therefore the meaning of temporality in their picture of the world is different than in our picture. Languages that only have names for two colors (Berlin & Kay, 1969) or three numbers (Pinker, 2008) in an obvious way condition the seeing of the world. In still other languages, the names of objects are complexes of properties attributed to them; for instance, the names for both a hand and a tree have a segment standing for a ramification. A different structure means a different logic of a language and conceptual network, as well as of the world seen through their prism. Therefore, the ultimate shape of the conceptual network

depends to a large extent on the ethnic language it “uses” and is developed within.

As a newborn child is practically devoid of the conceptual network, it is obvious that it does not possess (self-) consciousness. Its appearance and development constitutes the fifth aspect of the evolution of the conceptual network during ontogenesis. (Self-) consciousness must develop gradually, together with the evolution of the conceptual network. It was proposed previously (Korzeniewski, 2010, 2013a, 2015a) that the neurophysiological background of (self-) consciousness consists in a recurrent directing on itself of the cognitive center in the human brain, receiving by it signals from itself. Within the framework of the conception of the conceptual network, this is equivalent to the creation within this network not only of a representation of the external world, but also of a picture (model) of itself. This means, in a sense, that the network enters at a certain meta-level and looks from above, i.e., perceives its own existence. In the unconscious psyche, the processes of thinking occur at the level of the conceptual network, and their “field of vision” comprises only a representation of the external world in this network. Together with the appearance of self-consciousness, this field starts to also comprise the conceptual network related to the “cognitive apparatus” itself. This is the origin of the differentiation into “I”, that is the area of the conceptual network that knows both the world (its picture in the conceptual network) and itself, as well as the “world”, that is the area of conceptual network which is known, but itself does not constitute a part of the cognitive apparatus. This is the source of the extreme opposition in our psyche of the mind and the external world (broadly understood matter). They appear to be categorically identical only at the level of the conceptual network, for both are parts of this network (concepts or complexes of concepts, depending on the approach). Generally, the external world, physical reality or broadly understood matter is represented by (“contained in”) the part of the conceptual network that is not directed on itself, while the internal world, subjective psyche or self-consciousness corresponds the fragment of the conceptual network that is recurrently directed on itself, creates a model (representation) of itself within itself. This is strictly related to the superior topic of the present article that does not deal with the relation between the mind and the external world, but rather between the representation of the mind and the physical reality in our psyche (conceptual network).

Of course, these properties of the conceptual network result from the dynamic structure of the neural network in the brain underlying it. **Figure 1** presents the difference between a brain devoid of (self-) consciousness and a brain endowed with (self-) consciousness. In the former the cognitive-decision-making center receives signals (“sensory pictures”) from sensory cortex, analyzes and processes them (processes of thinking, planning and decision making), confronts them with the existing memory records and participates in formation of new memory records, finally it sends orders to motor cortex concerning partic-

brain devoid of self-consciousness



brain endowed with self-consciousness

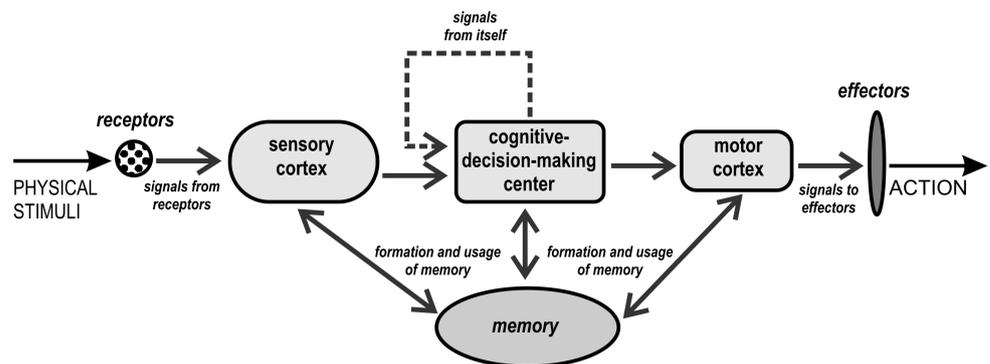


Figure 1. The difference between the brain devoid of self-consciousness and the brain endowed with self-consciousness. Receptors receive stimuli from the external world (or from the interior of the body) and send signals to sensory cortex in the brain (parietal, occipital and temporal cortex). These signals are appropriately integrated and processed. They are confronted with the existing (mostly episodic) memory records and participate in formation of new memory records (dispersed over essentially entire cortex including temporal cortex). The cognitive-decision-making center (located in prefrontal cortex) carries out processes of high-level analysis of “sensory pictures” coming from sensory cortex, thinking, planning and decision making. It also uses the existing (mostly semantic) memory records and creates new memory records. The undertaken decisions concerning appropriate actions are transferred to motor cortex (back of frontal cortex) that sends signals to effectors, mostly muscles, causing their contraction in accordance with an appropriate spatio-temporal pattern. The muscle work is coordinated by cerebellum. Again, motor cortex uses the existing procedural memory records and participates in formation of new procedural memory records. In the brain endowed with self-consciousness the cognitive-decision-making center receives signals not only from sensory cortex, but also from itself. It is recurrently directed on itself, creates a model (representation) of itself within itself.

ular movements that are to be executed (these can be locomotor, manual or oral motions). In the brain endowed with (self-) consciousness the cognitive-decision-making center additionally receives signals (“mental pictures”) from itself, forms its own representation within itself.

The formation of (self-) consciousness is strictly connected with the quantitative development of the conceptual network, origination of secondary concepts, processes of learning, and mastering of language. (Self-) consciousness emerges gradually and one cannot determine the moment of its origin in a non-arbitrary

way. It is of course possible to use different tests, such as recognition by a child of its own face in a looking-glass. However, such tests are able to probe only a few aspects of (self-) consciousness, and the criteria of classification of different reactions as conscious or unconscious are arbitrary and non-verifiable (e.g., recognition of one's own mirror reflection has been found in some birds, that are not suspected of having (self-) consciousness; Macphail, 1998).

The primary "evaluating factor", the "drive of cognitive activity" is constituted by the center of pleasure in the human brain (which can be roughly identified with the dopamine-related reward system). In the case of a baby, this statement refers to the simplest, biological significative axes. In an adult man, in a fully developed conceptual network, any activity and evaluation is still related, directly or indirectly, to the stimulation (positive or negative) of the center of pleasure (reward system). It seems to be characteristic for man that this center can be stimulated not only by stimuli fulfilling biological needs (satisfying hunger or a sexual impulse), but also by "stimuli" of purely cognitive, artistic, and, what is more important, ethical nature⁶. Therefore, one of the main traits of humanity at the neurophysiological level is the ability to draw satisfaction from science, music, fine arts, but also from altruism, kind-heartedness, and disinterestedness. Nevertheless, it should be stressed that the commonly known and strictly localized (spatially and functionally) center of pleasure (or more generally the reward system) does not necessarily exhaust all functions of what I call the functional (motivational) center of pleasure.

Generally, the conceptual network is a derivative of two conditioning factors. The first is the inborn background for its development in the form of genetically encoded dynamic structures of the brain, endowed with determined possibilities and predispositions. The second is an acquired during lifetime complex of sensations and experiences, processed, analyzed, and interpreted by processes of thinking, planning and decision making. They are supplemented by chance that can direct the development of the conceptual network in an at least partly unpredictable way. There are no two individuals with identical brains, due to both genetic and phenotypic variability. Moreover, life experiences of different people differ drastically. For this reason, there are no two identical conceptual networks. There is no absolute identity of senses (meanings), valid for all psyches, or perfect translatability of senses between particular psyches, especially if their "bearers" speak different languages (indeterminacy of translation, Quine, 1960). Therefore, although it is possible to understand a given man relatively well at the level of linguistic communication, the understanding will never become complete, even if the man speaks the same ethnical language, as the same words and sentences refer to slightly different concepts in different people. Commonness of language does not, therefore, prove commonness of comprehension. These differences are of course (from the statistical point of view) greater between people speaking different languages, brought up and educated in different cultures.

Therefore, there is nothing like the ideal conformity of concepts that underlie

⁶However, it can be also activated by such factors as alcohol, narcotics, or excessive gluttony.

the same linguistic names in different people. This even applies to as “sharp” concepts as the concept of “number two”. This problem is strictly related to the evolution of the conceptual network during ontogenesis.

The concept of number “two” is not known to a baby the moment of birth, but its understanding and specification is gradually acquired during the development of the conceptual network during life. The child learns that it is an abstraction of some repeatable property of objects of the external world (e.g., two oranges, two dolls), which are not sharp concepts themselves (see Korzeniewski, 2013b). The understanding of the concept of the “number 2” is not acquired immediately and in one step during the individual development (Piaget, 1953). It is likely that a child creates in its brain different “hypotheses” when it associates different concepts and names. Some of these hypotheses become later “enhanced” by the repetition of facts that fit to them, while others are eliminated, as they do not find confirmation in further experience. If two apples and two roses are presented to a child and they are pointed out by saying “two”, then it can produce different associations. Either it will link the word “two” with the number of shown objects or, for instance, with their red color. If the name “two” coincides further on with two objects that can have different colors, or with any number of objects having red color, one of these “hypotheses” will be confirmed, while the other one is abolished. Normally, a child is consequently presented with two objects to and provided with the name “two”, so that it comes *gradually* to some, but certainly not “complete”, comprehension of this number. A partially alternative and partially supplementary possibility in relation to the creation of *ad hoc* hypotheses is remembering of different situations where the name “two” is pronounced and an (unconscious) attempt of abstracting of a common property of these situations. As experiences accumulate, the degree of understanding of the number two by a child, the level of abstractness of this concept grows. At some stage, a child can for example associate this concept with two similar objects in space, but not with two events following one another in time. One can imagine a culture that would use a different system of names and concepts for counting phenomena in time and in space (this undoubtedly would not remain without an influence on the comprehension of the world by this culture). At a slightly different stage, a child would apply the concept of number “two” to very similar objects, for example two cats, but not two different objects (if the child is shown a cat and a roe-deer in a picture, it will not perceive them as *two* animals). As we see, the specification, understanding, “abstractness” of the concept of the number “two” is gradual.

The same concept for a mathematician and for a child differs only quantitatively. For a child, this concept is evidently not sharp. If it were perfectly sharp for an adult man, this would mean a necessity of reaching a qualitative jump—a sudden and complete understanding of the number two at a certain moment of individual life. However, it is not possible to find out such a moment; on the contrary, we can observe many small steps in a progressing process of “understanding” (this does not contradict the fact that there exist moments of revela-

tion when comprehension and specification of a given concept advances very much—an occurrence of gradual, evolutionary changes does not mean that they must proceed all the time at the same pace). Even the apparently so sharp concept of “number two” can be further specified and sharpened—mathematics provides the adequate evidence to support this claim. The number “two” can be further defined in various ways, for instance as a set of sets possessing the property of “duality” (containing two elements), as was proposed by Frege, or as an abstraction of the double use of a function in Church’s “lambda calculus” (Penrose, 1990). It can be also “constructed” from an empty set (Barrow, 2002). Each determination of the number “two” attributes specified semantic connotations to it that are absent in other formulations. A “sharp”, perfectly specified concept of the number “two” is only a delusion founded by our mind (and language) that has nothing in common with facts (Korzeniewski, 2013b).

A significant regression in the degree and abstractness of the comprehension of numbers can be a result of damaging the brain in an adult man. This can happen in the case of an injury of the center responsible for spatial orientation, situated in the temple lobe (Gerstmann center). Most mental functions remain unchanged in a man with such a defect. He/she is still a normally intelligent individual. However, he/she is not able to perform even the simplest operations concerning numbers, e.g., adding up in his/her mind. Nevertheless, he/she is able to realize elementary calculations by means of material objects, for example fingers or stones. Therefore, it cannot be said that such a man does not understand at all the concept of number, but only that this concept is related in him/her to the “visual” properties of the surrounding space (after all, the center of spatial orientation has been damaged). This constitutes a further evidence supporting the postulate that our concepts are not as abstract as it could seem, and that their roots are in sensory stimulations (they are “anchored” in integrated sensory pictures). The localization of the function of spatial orientation and the understanding of numbers in the same center confirms this conclusion.

The Gerstmann center is a fragment of the brain cortex, the part of the brain responsible for association of stimuli, memory, and thinking processes. These processes lead to the origination of secondary concepts that enrich the “sensory” substance of primary concepts with the mechanisms of integration and association of different impulses in the brain. The damage of the Gerstmann center and therefore of the neural network underlying the “abstractive” part of the concept of number leads to damage of most of secondary concepts acquired during individual development and concerning numbers. There only remained primary concepts, localized “deeper” in the structure of the brain (or maybe less centralized, “blurred” over a large area of the brain cortex). In a normal man, they undergo processing and interpretation by secondary concepts. However, in the last instance, our “abstract” understanding of the number “two” is still dependent on and inseparably connected with the ability of counting on one’s fingers.

Each concept means by connotation, by reference to all other concepts. As no two identical conceptual networks exist, there are no two *perfectly* identical

meanings of the concept “number two” either, although the differences between these meanings can be so small that they are not detectable by our mind and language. This does not mean, of course, that there does not exist (whatever this could mean) a property of the external world which corresponds to our concept of number “two”, but only that the representations of this property in different minds are not identical. If different persons are shown a photograph of one hill or of two distinct hills, then they will of course provide convergent answers for the question: “how many hills are there in the photograph?” However, if the photograph presents one hill with two peaks, separated with a small pass, then the provided answers will differ. Of course, one could argue that different persons differently comprehend the concept “hill”, and not the concept “number two”. However, as the latter concept originated (like all concepts) by induction, then it cannot be “pure”, sharp and devoid of empirical “contamination”. The concept of the number two applied to two discrete objects, for example two atoms, *is not exactly the same concept* as the concept of the number two applied to continuous objects (e.g., hills), although the proneness of the human mind, and particularly of science, to shred the world into discrete categories with fixed labels of linguistic names thoroughly obliterates these differences (Korzeniewski, 2013b).

To sum up, a child gradually acquires self-consciousness in the result of a recurrent self-directing of a part of the conceptual network on itself. Therefore, it also gradually comes to the distinction between the mind (its representation within the conceptual network = fragment of the neural/conceptual network directed on itself) and matter (external world) (its representation within the conceptual network = fragment of the neural/conceptual network not directed on itself). Therefore, the sharp opposition between the mind and matter in human psyche, the fact that matter matters for us and we mind the mind so much, emerges gradually during individual development.

3.2. Biological Evolution (Phylogenesis)

As biological evolution is a continuous process, every property of living individuals, including mind and (self-) consciousness also had to be formed gradually, step by step, from something that had not yet been conscious. The process of emergence of our species *Homo sapiens*, or genus *Homo* in general, during biological evolution was continuous, and no sharp barrier separates the human from the non-human. This implies that the situation was similar in the case of the origination of (self-) consciousness.

As the conceptual network is an aspect, epiphenomenon (result of supervenience) or by-product of the activity of the neural network, the germs of the conceptual network can be expected to exist in organisms that possess at least the simplest neural network. Such a network appears in coelenterates (e.g., hydra) in the form of a loose complex of primitive similar neural (or neural-like) cells. In worms, neurons are organized (concentrated) in stems and ganglions, for instance in the “head” region. The “conceptual networks” of these organisms

are extremely simple. Their functional structure is mostly inborn, and their exclusive function is to “re-code” (translate) stimuli coming from the environment into the behavior of the animal. They have a purely biological, “reflectionless” function (“meaning”). However, this kind of “meanings” is characteristic not only for the neural network. They appear already on the metabolic/genetic level. A bacterium that produces enzymes decomposing lactose in response to its appearance in the environment, by activating (or rather de-inhibiting) the genes responsible for the production of appropriate enzymatic proteins (the theory of operon, [Jacob & Monod, 1961](#)), also responds adequately to (this time biochemical) signals from its surroundings. This response is a part of a “network” of biochemical and genetic mechanisms. Therefore, generally, the biological “meaning” can be identified with a purposeful behavior of living organisms at biochemical, genetic, cellular, physiological, or neuronal level. On the other hand, only the network of neural cells developed into a system complex and “excessive” enough to transform biological meaning into psychological meaning—the basis of our (self-) consciousness. Therefore, the beginnings of the conceptual network should be looked for in primitive neural systems.

The primeval “significant axes” (e.g., satiety—hunger, safety—danger, impulse/drive to transfer one’s own genes, cognitive impulse/drive) are inborn in primitive animals, including most of our ancestors, and their meaning is exclusively biological. Both the set of stimuli to which a given organism reacts and the behavioral repertoire of responses are frequently extremely poor. A tick can serve as an example ([von Uexküll, 1926](#)). It does not belong to our ancestors and is an external parasite. For this reason, both its “sensory world” and behavior are very simplified. However, at a certain stage of evolution our ancestors had possessed a comparable degree of complexity of sensory data, conceptual network, and behavioral repertoire.

The whole activity of a tick during its life consists of climbing on a tree, waiting for an animal passing-by, falling on it, and finding a proper place to attach itself and consume blood. Additionally, it must find an individual of the opposite sex and transfer its genes (or, more strictly, its identity) to progeny. A tick needs a very limited set of external (physical and chemical) stimuli to realize this task (mainly aromatic stimuli—a scent of butyric acid secreted by sweat glands of mammals, thermal stimuli—body warmth, and elementary sensitivity to light). The (representation of the) “world” of a tick—its “conceptual network”—is very poor. The concept “roe-deer” formed in its neural (and consequently conceptual) network is a combination of a characteristic scent, warmth, and taste of blood. For a human, “the same” concept is defined by millions of other concepts, concerning the appearance and behavior of a roe deer, its taxonomic position, behavior, habitat, anatomical structure, physiology, biochemistry, cultural aspects (e.g., hunting), and so on. Scientists well know that a roe-deer is built of atoms, these in turn, of a nucleus and electrons, which are ruled by the laws of quantum mechanics. Therefore, in man, the semantic context for the concept “roe-deer”, that is something that “defines” this concept, consists of his/her en-

tire conceptual network composed of a great number of concepts—nodes. In a tick, this network has only a few nodes. This huge purely quantitative difference causes that the “psyche” of a tick is completely incomparable to the human psyche. Of course, there exist also very significant qualitative differences.

In my opinion, the co-evolution of the neural system and conceptual network during biological evolution had the same five main aspects as during the individual development, namely: quantitative growth, emergence of “excessiveness” in relation to a purely experiential view of the world, increase in the share of the component acquired during an individual development, invention/mastering of language and the emergence of subjective psyche and (self-) consciousness. The quantitative development consisted in an increase of the number of elements of both systems: neurons, receptors, and effectors, on the one hand; and concepts, on the other hand. The origination of new senses and the development of the already existing sense organs enabled the growth of the quantity and variability of data about the surroundings. Therefore, the most primeval chemical sense (smelling, taste) was supplemented by the vision sense, hearing sense and mechanical sense (touch, pressure, pain). The already originated receptors underwent gradual differentiation and improvement. In some cases, it led to the formation of such sensitive and efficient sensory organs as the eye of vertebrates, the echolocation system in bats, the smell receptors of some moths detecting single molecules of sex pheromones, and the “heat eye” of a rattlesnake. To integrate and process the complex sets of signals coming from these receptors a more developed neural system was needed that formed complicated “sensory images”. As a result, a richer and more adequate representation of the external world was created in the neural/conceptual network. Concepts corresponding to particular “objects” or aspects of the reality were becoming more precise, because a richer, more diverse and with better resolution set of sensations was used to “define” them, and because they were integrated by the neural system with a greater efficiency. What is perceived by a human as a fish, with all the details of its appearance and behavior, for some primitive water organism can just mean “a movement in the water”, which is a signal of a potential danger. An improved representation (image) of the world was useful for organisms only to the extent that it could be “translated” (transferred) into an appropriate behavior (improving the chances of survival and reproduction). The development of receptors and the neural system had therefore to proceed parallel to the evolution of effectors (increase in their number, diversity, and efficiency of action). This led to the formation of still better developed locomotion system that could secondarily also fulfill certain manipulative functions (e.g., prehensile upper limbs in monkeys, apes, and men) and the jaws-, lips- and tongue-operating system that could be adopted in men also for speech-generating functions. This “operational” efficiency in receiving and integration of sensory data as well as in adequate reactions to complex signals from the external world require organisms to create in their neural network a representation of the reality, which corresponded in some way to the structure of the external world. This constituted the basis of the de-

velopment of the conceptual network.

The association of stimuli from the external world with reactions of an organism to these stimuli that was initially purely instrumental (ensuring the survival of the organism and not related to its “purely cognitive” abilities), leads to a more or less faithful representation of the structure of this world, as well of the objects/processes existing/occurring in it, within the neural network. Such a representation is always imperfect, and its form depends to a large extent on the physiology of sensory organs, on the complexity of the system of effectors (chiefly muscles) as well as on the dynamics of the neural network in the brain (integrative and associative structures). The essence, “substance” or content of concepts comes as much from the structure of the world as from the structure of receptors and neural connections—from their manner of ordering of sensations and neural signals in the brain. Humans, acquiring knowledge of the world, frequently do not take into account the fact that their thinking processes, entire conceptual network composed of concepts meaning by connotation, and therefore categories in which they perceive reality, reflect not only the “necessary” properties of the things in themselves (*noumena*), but also, to a large extent, the accidental (created in the course of biological evolution) mechanisms of the operation of human receptors and of processing by the neural system of the data coming from these receptors.

The increase of the “excessive” character of the neural network and conceptual network was the second aspect of the parallel biological evolution of both systems. It was related to the fact that some of their elements ceased to be responsible for direct “translation” of external stimuli into behavioral reactions of an organism. Instead, they took over the function of processing and integration of sensory impressions, locomotive coordination, accumulation of memory, planning of future actions, and finally—association and coordination of various functions of the neural system. This resulted in the development of the conceptual network that manifested itself as an increase in the number and diversity of received stimuli and elicited reactions, while their integration supplied new dimensions in the semantic space, new significative axes differentiating (defining) concepts. The above-mentioned “surplus” of the neural-conceptual system led to origination and development of the “internal dynamics” of the neural system (its “autonomous activity”) corresponding in the subjective psychical sphere to germs of the processes of thinking. At the same time, the sensory “ocularness” of the “content”, meaning of many concepts decreased. In the organisms where the neural/conceptual network realizes the function of simple translation of environmental stimuli into the behavior of an organism, all concepts are immediate derivatives of the structure of signals transmitted from sensory receptors (and appropriately integrated). They correspond to particular elementary “facts” (objects, processes) of the external world, and the complication of their structure reflects the “resolution” of receptors and the degree of integration of data they send to (other parts of) the neural system. I call such concepts “primary concepts”. They correspond to various “simple” objects and processes of the exter-

nal world, seen through the prism of the senses of a given organism. Therefore, one can qualify them as accessible through direct “sensory” experience. On the other hand, the appearance of the above-mentioned “excessive” areas in the neural system (and conceptual network) caused that some concepts lost their accessibility through direct “sensory” experience. This means that the meaning, the form of these concepts is no longer a simple projection of facts of the world, co-shaped by the physiology of senses. The “structure” of these concepts that I refer to as “secondary concepts”, is formed based on primary concepts, but it is also shaped by mechanisms of memory operation, integration and association of neurophysiological processes, and coordination of different parts of the neural system. Secondary concepts comprise all kinds of general and abstract concepts, not directly corresponding to simple facts of the real world. This does not mean that their structure has nothing to do with this world. They are formed in the process of association of primary concepts, and the manner of this association is not completely accidental either, for it had to pass the sieve of natural selection. This selection accepted only such types of integration that somehow reflected the structure of the world, allowing an organism to survive as well as acquire effectiveness in a purely instrumental sense.

For this reason, secondary concepts are not, and cannot be, completely separated from the world. They differ from primary concepts, as they capture the reality not only through the prism of the physiology of senses (and simple neural networks related to them), but also through the mechanisms of integration and association of stimuli, including (on a higher level) the processes of thinking, planning and decision-making. Perceiving, ordering the world in such categories as three-dimensional space, time, individual objects, and causal relations between them results from the manner of integration of sensory data by our brain. Predispositions to perceive the world in this way (that is to such-and-not-another integration and processing of sensory stimuli) are inborn (although, of course, the concepts of space, time, material objects and causal relations are not inborn). Nevertheless, the manner of sensory data integration/processing is not completely arbitrary. The “real” structure of the external world must be of such a kind that it allows the brain to order received stimuli in the categories of space, time, and causal relations. “Something” must correspond to these concepts in reality. On the other hand, there exist secondary concepts that have little to do with reality, for instance the concept of ghosts of ancestors.

Immanuel Kant (Kant, 1999) maintained that external stimuli (sensations) reach us from “things in themselves” (*noumena*) that are completely non-cognizable in principle. They are “pushed in” by human mind in some *a priori* categories, such as time, space, or causal relations that do not exist at all “out there”. These categories are absolute in the philosophy of Kant and lie entirely on the side of the human mind. On the other hand, the structures of human thinking shaped by evolution are, of course, not absolute and *something* in the external world corresponds to this what we perceive subjectively as space, time, material objects, processes, movement, and causal relations. The degree of the

cognition of the real world is gradable according to the evolutionary approach. This degree is very low in organisms that possess a weakly developed and differentiated neural system. It increases together with the development of the neural system as well the system of receptors and effectors, reaching its maximum in humans (at least in the present time on our planet; it is certainly possible to go further). It is most probably possible to follow a different evolutionary path and to develop different receptors (sensitive, for instance, to infrared radiation or ultrasounds) and different mechanisms of integration of signals coming from them. This would result in formation of a slightly (or very) different picture (representation) of the external world in the conceptual network. However, this picture would have to correspond, better or worse, with this world, otherwise its “owner” (“carrier”) would not survive as a biological individual (and species). Humans are able to compensate indirectly for the lack of some senses and in-born manners of seeing the world, by creating appropriate “prostheses” through the development of science and appropriate devices. Scientific methodology (including mathematics-based theories) can further improve the cognition of reality by gaining knowledge in ways that partially eliminate the necessity of direct sensory insight. The cognition of “things in themselves” (*noumena*), although impossible to an absolute degree, can be enhanced by development of the conceptual network and continuous verification of the “correspondence” between its structure and the structure of the external world. An appropriate scientific methodology is responsible for this.

The representation (projection) of the world formed in the conceptual network is neither a faithful image of this world, nor an accidental structure that has nothing in common with the structure of the world. There exists some, although imperfect, correspondence (“adherence”) between them. The development of the conceptual network proceeding in parallel with the evolution of the neural system and resulting in an increase in the number of concepts and in their better specification led to a more adequate and detailed representation of a greater amount of various aspects of reality. All concepts developed from, and are based, more or less directly, on stimuli received from the external world that are transformed into sensations by sense organs and integrative neural structures. At the same time, the connection of secondary concepts with the world is much more indirect than the connection of primary concepts. Generally, the structure of the conceptual network and the way how it “perceives” different aspects/objects/processes of the world (*phenomena*) is a derivative of both the nature of “things in themselves” (*noumena*) and of the physiology of senses and mechanisms of the neural system functioning.

The third common aspect of the parallel development of the nervous system and conceptual network during biological evolution is a growing contribution of the component of the neural network functioning, behavioral repertoire as well as integration, association and interpretation of sensory impressions that is acquired by an individual experience, and a decreasing contribution of the inborn, completely determined by the genetic record component. This aspect is strictly

related to the excessive character of the nervous system with respect to the function of a direct translation of the set of received stimuli into the behavior of an animal, and to the development of the memory-recording processes. As a result, the elasticity and dynamics of the conceptual network was significantly enhanced. Its dynamic structure was to a smaller degree determined genetically, and to a greater extent formed in the process of learning and gathering experiences during lifetime. The care for progeny enhanced this effect, as parents constitute a kind of a buffer between a young individual and the environment, its behavioral hood, which compensates for threats from the surroundings, supplies food and facilitates acquisition of experience until it reaches maturity. As a result, a young individual can be born (especially in humans) with an “inborn” conceptual network composed of only a simple system of “biological” significative axes, with a degree of complexity not much greater than of the conceptual network of a tick or tapeworm, since it has time to largely increase its complexity during ontogenesis.

The conceptual network acquired during the individual life is completely different from the inborn, genetically-determined conceptual network. First, the former is ampler and more differentiated than the latter. Only the structure of simple neural networks can be recorded genetically due to connotative meaning of particular neurons in this network and, in a sense, denotative relation between a complex of genes (representing a linear, one-dimensional record of information) and the genetically-encoded functional three-dimensional structure of the nervous system. For this reason, more complex conceptual networks can develop only in the way of learning, acquiring information during individual development. This can occur through the accumulation of experiences by the method of trial and error or by imitation of parents⁷ or other adult individuals. This kind of learning is characterized by quickness (the whole process is contained in an individual life), elasticity and excessiveness that allow to react adequately to unpredictable situations that have never been faced yet. It also allows a huge size and complexity of the developed network. The biological evolution of inborn schemes of neural (and conceptual) networks also consists in learning by trial and error, as various variants of neural (conceptual) networks originate, in the result of mutations in the genetic record, that “perceive” and integrate stimuli from the external world in a slightly different manner (creating slightly different pictures of this world), and respond to them differently. Only the most effective of them that are most adequately adapted to reality are passed through the natural selection sieve. However, this way of “evolutionary learning” is much slower (it occurs in geological time) and less effective. Moreover, conceptual networks formed in this process are much smaller, less complex, less flexible, and completely resistant to correction during individual development. On the other hand, even individuals of the same species can frequently live in quite different environmental conditions, and a behavioral repertoire that is adequate in some

⁷This is another role fulfilled by parents, besides creating a behavioral buffer between a young individual and the environment, feeding and taking care of it.

conditions can be quite inadequate in other conditions. For this reason, inborn conceptual networks are much less adapted to differentiated and significantly varying (in space and time) environments, than networks shaped during individual development. The lack of necessity of a genetic record of the functional structure of the whole neural network allows a much faster evolution of the nervous system, chiefly the brain. The acquisition of experiences during individual development (learning), also favors the origination of thought processes (autonomous activities of the neural network). An inborn, strictly determined neural network is devoid of elastic association of various processes and complex decision-making (based on previous experiences), strictly associated with the processes of thinking. Summing up, a genetically programmed conceptual network is poorer and stiffer, evolves slowly, is not endowed with autonomous activity, and reflects the real world less adequately than a conceptual network originated in the process of learning.

At some stage of human evolution⁸, our ancestors acquired the ability to use language, first spoken, and afterward written. This is the fourth aspect of the development of the neural and conceptual network during biological evolution. It required a co-evolution of the speech-generating apparatus (larynx, tongue, lips and so on) and the brain, for instance such centers related to using language as the Broca center, responsible for translation of thoughts into sentences, ordering words in grammatical sequences and formulation of linguistic utterances or Wernicke center responsible for understanding language. The existence of special centers in the human brain responsible for the usage of language supports the Chomsky's postulate concerning the inborn nature of the human ability to master language (Chomsky, 1968), although his conception of inborn Universal Grammar common for all languages did not find confirmation in facts. The origination of language not only enabled efficient interpersonal communication and greatly facilitated operation with the conceptual network, but also shaped (and distorted) the picture of the world formed in our mind (conceptual network) (Korzeniewski, 2013b).

The fifth, final aspect of the development of the neural and conceptual network during biological evolution is the origination of (self-) consciousness, the emergence the psychical subject able to follow (investigate) the processes occurring in these networks. This happened, when the cognitive apparatus ("the cognitive center") in the brain became directed on itself, as discussed in the previous sub-chapter. The "psychical" subjective consciousness is, at least in my opinion, strictly associated with self-consciousness. Its "seat" is the "cognitive center" in the brain (located in prefrontal and perhaps frontal cortex) that gradually originated during biological evolution and is most developed in *Homo sapiens*. It associates integrated data incoming from receptors with records of memory, coordinates various functions of the central nervous system, plans future actions, and makes decisions concerning the stimulation of effectors. In other words, it confronts signals from the environment with the acquired memory, knowledge, and

⁸It was certainly the genus *Homo*, and maybe only the species *Homo sapiens*.

the picture (representation) of the world formed in the conceptual network, but also uses these signals to form new memory records as well as to develop and differentiate the already existing representation of the world. This is presented in **Figure 1**. The thinking processes, based on the autonomous spontaneous functioning of the neural network, play an important role in this activity. Generally, they underlie what is called psyche. In most animals, the inputs of the cognitive system in the brain are constituted by receptors and centers processing signals coming from them (located primarily in sensory cortex). The (self-) consciousness originated when a part of the inputs of this center started to receive signals not only from the sensory cortex and memory records, but also from itself, became directed onto the system itself, created its own representation (model) within itself apart from the representation of the external world. This was equivalent to the self-recognition of the processes occurring in the cognitive center. These processes started to process themselves as well, in the same way they previously processed the data coming from receptors and memory records (see [Korzeniewski, 2010, 2013a, 2015a, 2015b](#)). This is equivalent to the relation of self-applicability, analogous to some degree to a similar relation constituting the logic of the liar's paradox, Russell's antinomy of classes ([Russell, 1975; Penrose, 1990; Barrow, 1992](#)), and Gödel's proof ([Penrose, 1990; Barrow, 1992](#)) (see [Korzeniewski, 2010](#) for detailed discussion), or to the concept of concept presented in this study, where "a concept" is also a concept.

As any other aspect of the structure and function of living individuals, (self-) consciousness originated gradually in the process of evolution. It is not possible to fix in a non-arbitrary manner the moment of its origin, as it is not possible to determine the strict moment of its emergence during the individual development. It was not that our forefather became suddenly fully endowed with (self-) consciousness, while his parents were entirely devoid of it. (Self-) consciousness was developing continuously, from generation to generation. Anyway, it is likely that some presently living animals (for instance chimpanzees or dolphins) possess germs of (self-) consciousness. Perhaps one of the reasons why the development of (self-) consciousness was stopped in these animals at a low level is lack of a more complex system of communication—the language. The relation between these phenomena is most probably bi-directional: language stimulates the development of (self-) consciousness, while (self-) consciousness stimulates the development of language (both constitute together a self-driving process). Dolphins are also devoid of such a perfect manipulative tool as the human hand, enabling the realization of more complex orders of the brain. Language that is itself a part of the conceptual network affects the development of this network in a fundamental way, as it significantly facilitates the process of operating with concepts within the conceptual network. The appearance of language within the conceptual network of primeval men acted as a positive feedback, resulting in a self-accelerating development of this network, including its elements directed on self-recognition.

Generally, (self-) consciousness appeared because of origination of a special

sort of the dynamic complexity of the system (neural network in the brain) (Korzeniewski, 2015a). When there comes into existence a certain degree and *kind* of the complexity of the neural network, self-consciousness must emerge (supervene)—its origination is inevitable. Therefore zombies (Chalmers, 1997), that is hypothetical humans that have the same functional complexity of the brain as “normal” people, but are devoid of subjective psyche and self-consciousness are impossible, and even logically nonsensical. Once a certain sort of the functional complexity of matter originates, it must generate self-consciousness (this also concerns life), as the latter is a necessary aspect (by-product) of the former (Korzeniewski, 2015a).

On the other hand, I cannot see (but maybe this is just a matter of lack of imagination) how quantum processes could potentially explain the genesis of (self-) consciousness, as proposed by some authors (Hameroff & Penrose, 2014; Poznanski et al., 2017; see also Al-Khali & McFaddent, 2014), although I proposed that the wave-function collapse or decoherence lies at the basis of the real (physical) flow of time, that is undoubtedly related to the subjective psychical flow of time (Korzeniewski, 2016). Similarly, I cannot understand how self-consciousness could emerge from the oscillations of simultaneous neuron firing with frequency 40 Hz (Crick, 1995).

The part of the neural and conceptual network that is not directed on itself contains the representation of the external world, while the part of these networks that is directed on itself contains the representation of the internal world that is equivalent to self-consciousness. Therefore, the apparently extremely sharp opposition within our psyche of objective reality (broadly understood matter) and subjective mind results directly from neurophysiology, from different signal processing by complexes of neurons in the brain. “Objectively”, this opposition does not matter, and we should not mind it so much.

Humans gradually acquired self-consciousness during biological, social, and cultural evolution. Perhaps, this happened only 50 - 20 thousand years ago. While the human brain reached its present size at least 100 thousand years ago or earlier, first artifacts like elaborated tools, adornments, and sculptures of human figures (e.g., so-called Venus statues) appeared c.a. 50 thousand years ago, first artistic wall-paintings—c.a. 30 thousand years ago, while first unquestionable intentional burials—30 - 20 thousand years ago (Dunbar, 2005). They can constitute markers of emerging/developing subjective psyche and self-consciousness.

3.3. Cultural Evolution

Culture accompanied the last stage of biological evolution and is present practically in the entire period of the individual development of man. As such, it co-shapes the conceptual networks of society members and is, in turn, formed by these networks. Culture constitutes a form of collective communication of people, both in space and in time. It binds sets of individuals (in particular: individual conceptual networks) into complicated “organisms” of societies having a complex, hierarchical structure and multiple internal relations.

The culture as a whole is related to the conceptual networks of people living in it and creating it. In this context, the psychological aspect of culture, and not, for instance, its material products, is of special importance. It can be said that culture constitutes something like the Popper's third world comprising a complex of scientific knowledge, ethical and aesthetic values, arbitrary conventions and so forth, situated beyond the material world (the first world) and human mind (the second world) (Popper, 1978). Culture (in particular: the conceptual network of culture) is attributed with autonomous existence, not reducible to psyches (conceptual networks) of individuals participating in it. I am not going to treat (the conceptual network of) culture as a separate and "absolute" philosophical being. Rather, it is a convenient conventional category, a commonly understood concept accepted because of its usefulness in ordering, describing, and interpreting the world of phenomena accessible to us.

According to this paradigm, culture is a kind of a conceptual network existing outside the psyches of participants of culture. Such a network contains an ethnic language used by a given culture, common knowledge, worldview, and scientific theories developed within it, its masterpieces of literature, fine arts, and music (existing in the form of a complex of their perceptions realized by the members of a given culture), conventional symbols, system of values, and, finally, various religious beliefs. Obviously, the amount of information contained in the conceptual network of culture exceeds significantly the capacity of the human brain (single human conceptual network). Such a network can exist only outside any consciousness, in the sphere of abstract beings. Additionally, there are no two identical individual conceptual networks. For this reason, the conceptual network of culture must be composed of more blurred concepts than the concepts of particular individuals, who specify the "cultural" concepts for their own use. The conceptual network of culture is a kind of a sum or a mixture (or a resultant) of the semantic systems of the members of this culture. Of course, the individual semantic systems developed in a given culture must in many aspects adhere to each other, so that they can be translated, at least partly, one into another. The ability to translate senses (conceptual networks) between different cultures depends on the degree of adherence, similarity, and mutual assimilation of these cultures. However, the very biological nature of the species *Homo sapiens* imposes some common features on all cultures existing on the Earth, ensures some degree of their similarity. On the other hand, there can exist alien, extra-terrestrial civilizations that do not share with the human civilization even the biologically-conditioned meanings (for instance use different senses and sense organs, lay eggs or reproduce asexually).

Culture, being at the same time a sum, an average, and a resultant of conceptual networks of its members abstracted from their minds, constitutes in modern societies an extremely developed and differentiated phenomenon. However, the contemporary cultures of "developed" societies appeared relatively recently (during last thousands-hundreds years), and before they had to evolve through much simpler stages from some germs which were not yet culture.

Culture and its origin are based on the conceptual network acquired during individual development, and not inherited through genetic transfer from ancestors (it is not based on genetically-recorded network of neural connections). The information concerning the “content” of culture is drawn from parents and tribesmen. The simplest process of learning is imitation. This is how young individuals learn to gain food, avoid danger, bring up progeny, and respect hierarchical principles. Also adult individuals can assimilate new forms of behavior from other adult individuals. For instance, if one individual in a herd of Japanese macaques invents the method of washing grain in water, in order to separate it from sand (sand sinks, grain floats on the surface), after some time the entire herd starts to do the same. This behavior is transferred to next generations through young individuals as an already-established behavioral pattern of a given population. The complex of such behavioral activities can be gradually enriched, as the population discovers still new possibilities of more efficient ways of gaining food, avoiding predators, hiding against bad weather or performing other, biologically important functions. For instance, some individuals can discover or invent simple tools, such as stones used to break nuts by monkeys or mussel shells by sea otters, thorns used by some birds to pick insects out of slits in the bark, or sticks used by chimpanzees to collect termites. The development of the behavior repertoire may also proceed by finding new sources of food, new hiding places or removing parasites by way of mutual grooming.

The above-mentioned kinds of behavioral activities, although frequently complex and associated with the development of the conceptual network, are not germs of culture yet. They realize well-determined biological tasks, everything is purposeful and nothing arbitrary in them. This concerns also the neural/conceptual networks underlying them. The discussed behavioral patterns *mean* in an objective manner, and their elements can be fully rationally justified and explained. These meanings lack subjectivity (or rather inter-subjectivity), arbitrariness and conventionality that are the most pronounced traits of culture.

The situation changes diametrically when conventionality and arbitrariness appear. Let us consider a certain herd of monkeys. In this herd a loud scream can be a signal of danger in the form of an approaching predator. Monkeys in the herd can give out slightly higher-pitched or slightly lower-pitched voices, but the pitch of the voice is initially accidental: the high- or low-pitched voice does not mean (designate) any (kind of) predator. However, at a certain moment of time one of the monkeys, preferably situated high in the hierarchy of the herd, starts to react with a high-pitched voice to a panther and with a low-pitched voice to an eagle. As different strategies of escape are required with respect to different predators, such a distinction would be biologically purposeful (increasing fitness). Therefore, it is likely that after some time all individuals in the herd will warn other herd members against a panther in a high-pitched voice and against a bird of prey in a low-pitched voice, and the warned individuals will react adequately. The origination of such a behavioral pattern is already a germ of culture.

This example is not a speculation. In reality, in vervet monkeys different voices are attributed to different kinds of predators (leopards, eagles) and dangers (snake in the grass) (Dunbar, 2005). Therefore, germs of culture can be found already in monkeys.

As it was said above, this what differentiates culture from purely biologically-purposeful activity, what constitutes its essence, is *arbitrariness* and *conventionality*. It was a pure chance in the above example that a high-pitched warning voice was attributed to a panther, and a low-pitched voice—to a bird of prey. The assignation could be reversed and the biological purposefulness of the discussed behavioral pattern would not change. On the other hand, the “cultural” conceptual network of the monkey herd was enriched by two concepts (meanings): “a high-pitched voice → panther → climb onto a tree” and “a low-pitched voice → bird of prey → escape deep into the tree crown”. A high-pitched voice and low-pitched voice can be regarded as the most primitive names, meaning (designating the concepts): “danger from the ground” and “danger from the sky”. For this reason, the presented example of the origination of culture constitutes also an example of origination of language: it is likely that they were inseparable almost from the very beginning.

The answer to the question why culture originated is essentially the same as the answers to the questions why life and self-consciousness originated. Namely, once appropriate conditions were fulfilled and the opportunity appeared, culture had to originate because of the development of psyche and social relations. This process was favored by language that codified the conventional system of cultural meanings. The originated self-consciousness that could fulfill some biological-social functions (for instance clear separation of oneself from the surroundings, including other individuals), required knowledge not only about the external world, but also about oneself. The knowledge about the surroundings was constructed to a large extent by chance from accidental meanings. These meanings did not have to represent adequately the reality, if only the indifferent physical world expressed its silent agreement. Generally, the most important “mechanism”, if we leave aside various limitations imposed by the physical, biological, social, and evolutionary “medium” of culture that led to the origination of the conceptual network of culture was chance. Additionally, it was the active “material” that shapes culture that is human mind.

The conceptual network of culture did not start from nothing, but from a complex of purely biological meanings. In principle, its evolution is not limited by anything within the borders fixed by the physical and biological (and social) reality (the cultural conceptual network must not decrease the efficiency of functioning in this reality). Like in the case of biological evolution, the previous evolution of culture determines, limits and “channels” to a large extent the ways of its further development—the already existing system of cultural meaning constitutes the base and starting point for the origination of new meanings. New concepts are built in the conceptual network of culture (and, in a more detailed form, in the conceptual networks of its members during individual develop-

ment) based on the already existing concepts. The conceptual network “offers”, through its present structure, a certain limited (although still huge) spectrum of development routes. However, the choice of one of them is arbitrary and accidental (if we treat as a chance the fact that a given person with such-and-not-another psyche invented such-and-not-other cultural senses, and that these senses were accepted, “absorbed” by other members of the society). The evolution of the conceptual network of culture is therefore a cumulative process, “remembering” its previous development. However, paradoxically, fully conventional and accidental meanings become, once they come into being, unshakeable and absolutely “true” within a given culture. The long and inglorious history of religious wars testifies to the strength of meanings created by pure chance.

Humans live in a unique physical and biological world. On the other hand, there exist (and existed in the past) an enormous quantity and diversity of cultures. This fact can be explained by the accidental character and conventionality of meanings of culture. The divergence of cultural evolution can be seen in the variability of beliefs, religions, philosophies, rites, customs, ethical systems, fine arts, and, last but not least, languages. The more divergent cultures are, the more difficult is to translate their concepts, meanings, and worldviews between them. These difficulties in understanding other cultures increase with the dissimilarity of ethnic languages, whose structures have a huge impact on the perceiving, interpretation, and categorization of the world, the shape of its representation in a given culture (Sapir and Whorf theory) (Sapir, 1921; Whorf, 1940). The Quine’s thesis concerning the indeterminacy of translation of ethnic languages (Quine, 1960) is, after some consideration, obviously true. Complete understanding of a given culture by a man brought up in another culture is in principle impossible, because of the absence of mutual adherence of the conceptual networks of these two cultures.

The senses existing within separate cultures and related to religion, fine arts, social relations, and language are purely intersubjective and disappear (completely or to a large extent) once one leaves a given culture. This fact is strictly related to the divergent evolution of cultures. As long as the elementary facts, laws and requirements of (physical and biological) world are obeyed by members of a given culture, for instance the necessity to feed and to avoid predators as well as to protect oneself against cold and parasites in order to survive, the objective world is neutral in relation to such a culture and gives it full freedom. Most of the content of various cultures only has such a connection with the external “objective” (physical and biological) world that is absolutely necessary. Otherwise, cultures could not exist, as physics and biology neither promote any ethical or aesthetic values, nor favor any rites, nor else affirms any kind of divinity. However, there exists a cultural domain that opted for a significantly closer connection with the external “objective” world, and therefore resigned from the right to unlimited production of unrestricted and conventional “subjective” meanings that become the exclusively valid and obligatory “truths” once they have come into being. This domain is science.

Let us imagine a developing conceptual network, where new concepts are being created. Still other concepts develop on their basis. In this way, there come into being “conceptual chains”, understood as sequences of primeval and derived concepts in the conceptual network. If the development of such chains is conditioned only by the already existing structure of meanings, the indeterminacy of their meanings—i.e., the impossibility to derive them univocally from initial conditions—accumulates when we move along the chain. Sufficiently long chains—no matter how well determined concepts they are composed of—can “bend” and “deflect” optionally far away from a certain assigned line in the semantic space. The susceptibility to such “deflection” is a measure of the indeterminacy of concepts (for instance, it is relatively very small in mathematics). If several conceptual chains develop independently from some conceptual germ, for instance from the “commonsensical” conceptual network, then, at a sufficient distance, these chains diverge sufficiently far one from another, that is, they fall into (semantic) contradiction with each other (different religions and philosophies can be quoted as an example).

The situation is different in natural sciences. Here, all newly-formed concepts are confronted with the external world without delay (or with a certain finite delay). For instance, the theory of the Big Bang and the Steady-State Theory, both postulated to explain the redshift of distant galaxies related to their “escape” from the observer on the earth, coexisted for some time, due to the absence of an experiment (or observation) that could falsify one of them. Thus, their choice reflected only the philosophical preferences of their inventors. However, the discovery of the microwave background radiation judged in favor of the first theory. Therefore, the objective world fixes lines in the semantic space, which must be followed by conceptual chains in science, if the conceptual network is to contain a reasonably faithful representation of the world. Cosmic ether, phlogiston, or vital force provide other examples of concepts that are already dead, once they have been falsified by the natural sciences. Of course, the mutual adherence of these lines and chains of concepts is never perfect, even in science. However, semantic indeterminacy does not accumulate here, together with the development of a conceptual chain. Instead, it remains more or less constant. Therefore, assuming that the external world is coherent and non-contradictory, it imposes the coherence (of course only in an imperfect and approximate way) on the structure of the conceptual network of science.

The situation is completely different in the case of broadly understood culture and the humanities (including most philosophies). Concepts in conceptual networks in these domains are little specified, “blurry” and vague. The possibility of their verification by confronting them with the objective world is very limited. The evolution of conceptual networks of natural sciences that originated in different cultures must be convergent. This is because their structures must adhere to the structure of the real physical (and also chemical, biological, geological etc.) world. The methodology of natural sciences can compensate any significant deflections of the structure of the conceptual networks of scientific disciplines

from the latter. This is an example of the negative feedback. On the other hand, in the evolution of most of culture (especially philosophies, humanities, and religions), accidentally chosen directions of further development are enhanced and followed consequently. The already existing structure of the conceptual network of culture fixes the frames for its further evolution, but within these frames chance rules. This constitutes an example of the positive feedback. The further a given culture goes along a given route of development, the more decidedly it follows this route. As the direction of development is “chosen” in given culture by chance, evolution of different cultures is divergent. The humanities, studying culture, create it at the same time. For natural sciences, the object of their studies exists independently of them. Culture and the humanities (and many philosophies) frequently create by themselves the object of their studies. Science can be compared to a convolvulus that winds around a wooden pole (=reality). On the other hand, a complex of various cultures (including philosophies) resembles a bush bifurcating vigorously in all directions.

During the evolution of the conceptual network of culture there can be seen a clear tendency to absolutize linguistic names and their underlying meanings (concepts) and to attribute real existence to their designates (Korzeniewski, 2013b). The real world, continuous in its essence, is, when seen through the prism of language, “sliced” into sharply separated pieces, organized in a discrete way, pushed in into the corset of absolute categories (Korzeniewski, 2013b). Linguistic names demarcate arbitrary discrete objects, events and sets within the reality, which are “naturally” absent there. Inevitably, the names and sentences of language correspond only roughly and approximately to some aspects of the world, and attribute to the world features that are only and exclusively features of language. The segregation of the phenomena perceived by our senses and processed by integrative structures in the sensory cortex (that already carry out a preliminary categorization) into different discrete semantic compartments facilitates excellently our manipulation of the accessible information, and therefore the functioning and development of the conceptual network. However, this process results at the same time in a significant distortion of the representation (picture) of the world formed in within the conceptual network (Korzeniewski, 2013b).

Culture as a whole and most of philosophy have much in common with magic and religion. All these disciplines are characterized by far-going autonomization, absolutization and “realization” of words of language. For instance, magic not only establishes a kind of necessity of the relation between names and their designates, completely ignoring its accidental character, but also endows words a performative power. The esoteric and necessary character of names also manifests itself in religion. For instance, Jehovah’s Witnesses take pride in their knowledge of the true name of God. On the other hand, philosophy has a strong tendency to absolutize such names (and concepts) as spirit, matter, monads, four elements, but also for instance scientific paradigms (Kuhn, 1962) or “research programmes” (Lakatos, 1970), and so on. However, the world is not discrete like

language, but continuous like the conceptual network. Therefore, recognition of the “fact-creating” role of language has a fundamental significance for epistemology (Korzeniewski, 2013b).

Also here, science plays a significant role. Physics decomposed the concept of matter into field equations, functions of probability, equivalence with energy and other concepts, being as much real objects as products of our mind, so that matter has become in fact only an empty name (Korzeniewski, 2014). The process of decomposition of the concept of (self-) consciousness (spirit) into other concepts performed by neurophysiology is also significant, although it has not advanced that far. Nevertheless, the apparently sharp opposition between the mind and matter seems to vanish gradually, being “dissolved” in the sea of the surrounding concepts. Matter seems to be to an increasing extent (at least within theoretical physics) a product of the human mind, while all known evidences indicate that the mind emerges from the functioning of (sufficiently and appropriately complex) material systems (human brains). I propose one of possible ways how this can happen. As the development of science proceeds, the mind-matter opposition matters, and scientists mind it, still less and less. The same applies to many other concepts and problems, with which philosophy struggled for centuries, and which were shown by science as empty or apparent. Therefore science, by escaping from the conventionality of culture, enables us to de-mythologize many aspects of our culture. At the same time, science (especially neurophysiology and psychology) suggests that the conceptual network is a more adequate tool for formation of a relatively faithful representation of the world than language. Language, being anyway a part of the conceptual network, is a very efficient tool that allows an easy, but far from perfect, operation and manipulation with concepts within the entire network. However, this does not mean that human thinking has a linguistic nature and occurs primarily at the linguistic level (Korzeniewski, 2013b, 2015b).

Already the great number of ethnic languages, each of which shapes, represents and deforms the structure of the world in its own, different from other languages way, testifies to the inaccurate “adherence” of various language to the reality, and to each other. Languages are frequently so different (and sometimes simple) that science as we know it could not originate at all in many of them (and therefore in the minds of the people using them), or it would have a rudimentary character, adhering very weakly to the structure of the world. We are so accustomed to European (or, more broadly, Indo-European) languages, which seem so different for us, that we usually do not realize the true diversity and dissimilarity of languages developed in different cultures and ethnic groups. The most primeval Khoisan languages use click consonants instead of “normal” sounds as phonemes (Barnard, 1988). There exist languages that have names for only two colors (Berlin & Kay, 1969) or three numbers (Pinker, 2008). Multiply (groups of) languages have completely different structures and grammatical rules than (Indo-) European languages. It is difficult to imagine the development of science, or even a more advanced culture in populations speaking (exclusively)

these languages. The fact that Western science originated in the circle of the Mediterranean culture is probably a derivative of many factors, including language and (especially protestant) religion (Weber, 1930) as well as chance. Nevertheless, language is not an autonomous phenomenon, but a fragment of the conceptual network of the entire culture and of its members. There takes place a bi-directional relation between them: language stimulates, co-shapes, but also limits the development of the conceptual network, while the latter constitutes the semantic “lining” of language. Generally, the present form of the conceptual network of a given culture (comprising language, science, religion, system of beliefs, customs and so on) in the last instance is a result of its evolution consisting in a sequence of accidents and various limitations.

The only thing a purely biological organism cares about is survival and propagation of its identity (defined within the cybernetic paradigm as a network of negative feedbacks/control mechanisms: see below). The probability of realization of this task determines its fitness. However, *Homo sapiens* “climbed up” above the exclusively biological level and reached the psychic, social and cultural level. People realize not only purely biological purposes (especially reproduction with a maximum possible speed), but first of all psychic and cultural purposes, even if they stand in contradiction with the former (Korzeniewski, 2010). One of such chief psycho-socio-cultural aims is “transferring” one’s own conceptual network to other members of the society (appropriate “fertilizing” their psyches), “spreading” its elements (concepts and their complexes) within the culture, by analogy to the transfer of one’s genes (and the whole identity). Practically nobody in the modern civilization tends to produce the maximum possible amount of progeny, and some people do not reproduce at all, as they sacrifice their lives to science, fine arts, religion, or other kinds of social activity. These fields constitute effective means to “propagate” within culture somebody’s convictions, intelligence, personality or, in other words, the elements of one’s conceptual network because they enable a broad social response. This is a much quicker, more effective and, first of all, more faithful way than the genetic transfer of the elements of somebody’s psyche, especially that the inheritance of psychical traits (e.g., intelligence or musical abilities) is only limited, uncertain and to some extent random. In this context, the psycho-socio-cultural individual predominates over the purely biological individual. As the content of one’s psyche constitutes his/her identity, one can leave more after himself/herself in the form of a scientific, technical, literary, artistic, social, economic, or political output, than in the form of his/her genes (biological identity). Of course, all intellectual, artistic, or social motivations cannot be reduced to the will of “broadcasting” of one’s personality. Nevertheless, such a mechanism can overcome biological motivations, in particular the drive to propagate one’s own genes (biological identity) in a possibly great number of copies. Anyway, no “higher” activities and motivations are needed to demonstrate the superiority of the psychical individual over the biological individual: the pleasure drawn from convenient life, good food, non-procreative sex, alcohol, narcotics, and tobacco is

completely sufficient. This aspect of humanity has not been taken into account by, for instance, socio-biology, or at least its extreme forms. As an example there can serve the origination of ethics, which cannot be completely explained within the conceptual framework of socio-biology, although socio-biology can investigate the biological roots of ethics. Even the so-called reciprocal altruism (which is not altruism at all), frequently used in models of population genetics, assumes the existence of some minimal psyche that enables individuals to recognize other individuals in a herd and to remember the results of previous meetings with them (Dunbar, 1996). The psycho-socio-cultural level created its own aims and values that are not based on, independent of, and frequently are contradictory with the “aims” of biological evolution. The central “arrow” of biological evolution is the axis: fitness—lack of fitness. It is replaced (to a large extent) in the psycho-socio-cultural evolution with the axis: pleasure—lack of pleasure. The feeling of pleasure, underlined on the level of the neural network by a positive stimulation of the reward system in the brain, appeared initially during biological evolution as a fitness-maximizing mechanism. However, these two axes diverged to a large extent during the human evolution—in highly-developed civilizations, natural selection is essentially weakened and leaves a broad space of freedom for psychological, social, and cultural mechanisms determining human behavior. A completely new, psycho-socio-cultural level of reality emerged in the moment of this divergence. Pleasure gained its autonomy as a psychic phenomenon together with the emergence of self-consciousness and the subjective psychic sphere. A new kind of evolution began with the appearance of self-consciousness, namely cultural evolution, which has nothing in common (apart from obvious biological connections) with natural evolution.

As man is a social creature and a psychic individual, he/she also becomes a cultural individual. Similarly as the biological individual, it is directed on “self-copying” (self-projecting) of its own identity, its expansion and preservation of the continuity of its existence in time. Of course, here the psychological identity, and not biological identity, is in question. The role of a man as a member of society and culture requires him/her first of all to preserve his/her identity. People in society are not mutually replaceable (like ant workers in an anthill) not because of genetic (and therefore biological) differences between them, but because of their psychic-social roles. Therefore, the psychological identity is undoubtedly something completely different from the biological-evolutionary identity.

The preservation in time and possible extension of its operation and impact range, namely the dissemination of its elements among the members of a given society, becomes of primary significance for the psychological identity. This expansion can adopt various forms. In the simplest case, it is realized by contact with other members of society, education of children, pronouncement of one’s own opinions and so on. Scientific, philosophical, literary, artistic, social, and political activities are its more sophisticated manifestations. In extreme cases, it manifests itself as a pursuit of fame or power. The projection of identities of members of a society onto this society as a whole leads to establishing a certain system of cultural

senses. Nevertheless, much more people accept (and propagate) cultural senses created by other people, than invent and propagate their own senses.

Cultural senses are ultimately born from chance. On the other hand, the selection of senses that are to be consolidated in a given society/culture is decided to a large extent by the impact of the expansion of psyches that “carry” certain senses in relation to the impact of the expansion of psyches promoting “competitive” senses in the “environment” of the conceptual networks of the society members. This resembles a natural selection of cultural senses (memes in Dawkins’ terminology; Dawkins, 1989), and therefore is analogous to biological evolution, although occurs at a different level.

The differences between various psyches can be at least partly reduced to different world pictures and complexes of cultural senses they contain. Inborn genetic predispositions play a rather insignificant role in “acquiring” cultural senses. The probability that an African, born and educated in a Christian society, will adopt belief in Christ is much greater than the alternative that he/she will come back to the religion of his/her ancestors, particularly if nobody informs him/her about the “existence” of African idols. A huge majority of cultural senses is inherited through the mediation of cultural transfer, and not via the biological channel. A great role in this process is played by parents, school, society leaders and so on. On the other hand, particularly in the modern civilization of the West, man is exposed to a great diversity of propositions of cultural senses to choose from. Such a possibility, although much more limited, has existed in all cultures since their origin.

A man does not only take over senses from other people, as he/she is, at least potentially, an effective generator of new senses. What in most members of society occurs on a small scale and concerns secondary things, determines the exceptionality of so-called outstanding persons: scientists, philosophers, artists, men of letters, politicians, or prophets of new religions.

To sum up, cultural senses exhibit a large diversity, can be “inherited”, and new cultural senses can be generated based on old ones. Then, these senses undergo selection by their psycho-socio-cultural environment and the senses that have the greatest “psycho-socio-cultural fitness” survive and can be further propagated. Therefore, the complex of cultural senses seems to be to some extent analogical to the genetic information of particular individuals in a biological population, which also exhibits a differentiation, is inherited, undergoes mutations leading to new variants of this information, and, finally, it undergoes natural selection.

Only relatively few of the senses (constituting complexes of concepts) that originate within culture become consolidated into its conceptual network for longer periods of time. Nevertheless, the senses that constitute a given culture evolve during the development of this culture. Such changes can proceed gradually or they can be characterized by the appearance of great turning points, as took place in the case of the Copernican Revolution or the origin of the Christian religion (which does not mean that the propagation of both ideas was very

quick and proceeded without obstacles). Generally, a competition between different senses takes place within each culture, and some senses win this competition and become consolidated, while other senses lose it and are eliminated. The mechanisms or criteria responsible for the selection of senses at a particular stage of cultural evolution seem to be of principal importance.

A psychical individual constitutes a “seat” of cultural senses, just as a living individual is a “carrier” of the biological identity (encoded by a set of co-operating genes⁹) in a population. The latter tends to propagate its biological identity in its physical/biological/social environment, while the former strives to propagate the complexes of concepts generated/accepted by him/her in the “environment” of the conceptual network of the culture he/she lives in, to transfer them to other “members” of this culture, particularly to his/her own progeny. The efficiency in spreading the senses accepted by a given psychical individual measured against the efficiency of dissemination of the senses proposed by other people is decisive for long-term success. It depends not only on the pure attractiveness of these senses for their potential receivers, but also on the accessibility of mechanisms enhancing the dissemination of senses in a purely instrumental way. Such a mechanism can be the naturally privileged position of parents in relation to their children or of people having access to mass-media, politicians, the Church, and finally men of letters, artists, and scientists in relation to common people.

The cultural selection of senses is imposed by the “cultural environment” that encompasses the set of all human psyches. The direction of development of a given culture and selection of senses that are assimilated from other cultures or established within the culture, is determined to a large extent by the already existing cultural pattern. Of course, there exist economic, political, demographic, biological, and physical limitations for the potential directions of this development. Within these limitations, the selection of newly generated senses is carried out by the network of already existing senses. If the “carriers” of the new senses possess greater potential for expansion than cultural individuals representing the old system of senses, either due to pure attractiveness of these senses or to the above-mentioned instrumental mechanisms, then new senses will be consolidated and propagated within culture. Inversely, if the old system of senses turns out to be “better” in a given cultural context and resist any innovations (“mutations”), then the *status quo* will be preserved.

4. Conceptual Network and Philosophy

4.1. Philosophy as a Product of the Human Brain

Studying philosophical problems, we frequently ignore, explicitly or implicitly, that our entire cognition in general, and philosophical considerations in particular, are a product of the human brain, the material “carrier” of our mind and

⁹Contrary to the claim of Dawkins (1989), most genes cannot be “selfish” and have to co-operate in order to ensure the survival and efficient reproduction of the individual they are a part of, to cause that its fitness is possibly high.

self-consciousness. The substance, dynamic content of the latter is the conceptual network, which is an aspect, epiphenomenon (result of supervenience) or by-product of the “functional substance” of the brain, namely the neural network. The functioning of subjective psyche and (self-) consciousness is based on the changing pattern of activation of particular concepts in the conceptual network. The meaning of the concepts is realized through connotation, relationship to other concepts. Sensations and concepts are epiphenomena, aspects, or by-products of integrative and associative structures in the brain. The neural network is organized in a special way and is characterized by a high degree and determined type of complexity. In particular, I postulate that a fragment of it, underlying self-consciousness (subjective mind), is directed on itself, receives recurrent signals from itself and creates its own model within itself, while other fragments, for instance those underlying the representation of the external world (broadly understood matter), do/are not. All these features have pronounced implications for philosophy, among others for the nature of our cognition, its relation to the world “out there”, for the status of universals (universal beings) and for the mind-body problem.

The fact that the meaning of the conceptual network is of connotative nature has extraordinary importance for understanding the essence of human (self-) consciousness, the nature and limitations of thinking processes as well as the degree of validation of our cognition and the status of the world picture created with its aid. This statement concerns especially all philosophy. The connotative character of the conceptual network inevitably results from the structure of its physical “carrier” (background): the neural network. However, we can forget about that for a moment, for our mind has direct access only to the conceptual network. This will allow us to see, without superfluous “contaminations”, how the world looks in the perspective of the conceptual network.

It is of fundamental importance that in the connotative conceptual network, any senses and meanings exist only and exclusively *in relation* to other senses and meanings. The status of our opinions can only be *relative*, dependent on the context of the senses “surrounding” them (Korzeniewski, 2014). This is because concepts do not designate directly any objects, sets or processes existing outside the conceptual network, either in the external world or within the subjective psyche: the meaning of concepts realizes itself only in relation to other concepts. It is impossible to announce any truths which are in any way *absolute*, valid regardless of their reference, any senses existing *beyond* the area of conceptual network (Korzeniewski, 2014).

4.2. Conceptual Network and *Qualia*

According to the conception of the neural network underlying the conceptual network, *sensations* correspond to (complexes of) concepts in conceptual network directly activated by (received by sense organs and appropriately integrated) stimuli from the external world. In turn, the activation of (complexes of) concepts (corresponding to associative structures) is an epiphenomenon (result

of supervenience), aspect or by-product of the conduction of signals through appropriate groups (complexes) of neurons forming neural routes, circuits and “objects”. There is nothing like “qualia”: discrete beings (entities) invented by philosophers as “carriers” of the qualities of sensations, for instance of the “blueness” of blue objects perceived by our mind (Chalmers, 1997). Just the opposite, the sensation of “blueness” is “blue”, as the neural “structure” (the group of neurons connected functionally in an appropriate way) corresponding to (underlying) the concept of blueness is “connected” (in a complex functional way involving signal integration) to receptors in the retina (cones) sensitive to the “blue” range of the spectrum of visible electromagnetic radiation. During our life, this “structure” learns that some of the perceived objects activate/create fragments of the conceptual network co-defining the concept of blue (send photons = quanta of electromagnetic radiation of a proper energy/wavelength that are detected by the receptors of “blueness” in the retina), and the conceptual network learns that “blueness” is the common property of the objects that activate/co-create this concept. In such a way, the “blueness” in the conceptual networks co-defines all blue objects, while all blue objects co-define “blueness”. This property represents just the meaning by connotation described above. It is not possible to understand or even “see” (perceive) the “blueness” without all blue objects one “encounters” in one’s life that became incorporated (as representations) into one’s conceptual network. “Blueness” is not a “simple”, discrete, autonomous being. The cones in the retina of the eye in reality only receive/are stimulated by electromagnetic radiation of a certain concrete wavelength. The subjective mind does not perceive the (absolute quality of the) “blueness” itself, its ultimate essence, as nothing like this exists, but only the very core of the concept of “blueness”, when the neural sub-network underlying the concept of “blueness” is activated by signals from “blue” receptors. This sub-network can be also activated “indirectly” by impulses generated internally within the brain by its autonomous activity (using the existing memory records) like thinking, imagining, recalling, or dreaming. However, the “blueness” that is “generated” in such a way (appearing in thoughts, remembrances, dreams or hallucinations) is much less “visual” and intense.

The neural context of the concept of “blueness” determines the “quality” “core of the content”, the very essence of the perception of “blueness”. One does not experience “blueness” because “blue” receptors send to the visual cortex different neural signals than “red” receptors, but because the structure of the neural object corresponding to “blueness” was stimulated during our whole life by blue objects, acting (by sending “blue” photons) on “blue” receptors. One can carry out a thought experiment in which a neuro-surgeon cuts the neural connections between “blue” receptors and the “blueness” center in the neural network in the brain of a patient, and connect the “blueness” center with “red” receptors. Then, a red rose is presented to our patient. What will he/she see? Of course, a *blue* rose. This is because the subjective sensation of “blue” is not what stimulates “blue” cones in the retina, but what activates the “blueness” center in the brain.

Therefore, “blueness” is not a separate, individual entity endowed with a discrete quality, a *quale*. It is not a primary feature. Just the opposite, it is a secondary, derivative property, the common aspect of all objects which, during the life experience, stimulated just “blue” receptors, a property which was represented, through appropriate signal integration, in the brain during its development, in the form of the “blueness” center. The concepts of “blueness” of various people differ to some extent from one another. The “bluenesses” of a normal person is very different from the “blueness” of a color-blind person. Even people that are completely blind from the birth have some “concept” or “imagination” of “blueness” (for instance of the blue sky), although not based on visual experiences. The “bluenesses” of a human, a bird and a fly differ quantitatively (humans have much more neurons/concepts that co-define the property of blueness), but first of all qualitatively (a bird has four types of cones sensitive preferentially to four wavelengths of the electromagnetic radiation, and therefore has a four-dimensional “palette” of colors, while a man possesses only three types of cones; a fly has completely different, complex eyes than mammals, visual receptors sensitive to the range of “colors” of photons from orange to ultraviolet, and can see the direction of light polarization humans cannot perceive). Humans are capable of perceiving/experiencing “blueness” and a video camera is not, as it does not possess the concept of “blueness”, defined by thousands of other concepts, which can be activated by “blue” stimuli from the external world. For this reason, it is not able to classify, interpret and “understand” these stimuli as “blue” ones.

In short, *qualia* understood as absolute, autonomous, discrete, and independent “carriers” of the qualities of sensations simply do not exist, or have any sense at all. Just the opposite, such sensory qualities as “blueness” have a relative, relational nature, as their “content” and essence is defined, and in fact created, by the “surrounding” concepts in the conceptual network meaning by connotation. The problem of *qualia* as elementary and indivisible “qualities” of sensory data is tackled in a known thought experiment intended to demonstrate their autonomous existence, irreducible to their material “base” (Jackson, 1982, 1986). A neurophysiologist Mary is a researcher dealing with the nature, perception, and material base of colors, with everything that scientific knowledge can tell about them. However, all her life Mary was kept in a closed room, where everything, including her body, was painted white, black, or grey of various shades. She did not have access to any other colors. During her research, she acquired complete knowledge concerning, for instance, (the essence of) red color. Namely, Mary learned which range of the length of electromagnetic radiation corresponds to the red color, which cells (cones) in the retina are sensitive to the color and in what manner nerve impulses are generated and processed (and in which neurons and neural networks) in answer to the perception of “red” quanta of electromagnetic radiation, and how neural signals are integrated in order to produce the subjective sensation of redness, *etc.* However, Mary has no idea what somebody feels, when he/she experiences (perceives) a psychical sensation of redness. She does not know, what it is like, when the “red” *quale* appears in

the light of consciousness. Therefore, when finally Mary leaves the black-and-white (-and-grey) room and enters the external world full of colors, the first perception of redness, first experience of a “red” *quale* will provide her with some completely new knowledge she was not able to acquire by analyzing the physical and biological aspects of the perception of red color. This thought experiment was intended to demonstrate that the understanding of the “objective” mechanisms that lead to the appearance of subjective psychical sensory perceptions is not identical with the perceptions themselves, with directly-experienced subjective “content” or quality of such perceptions.

While the general conclusions of this thought experiment are correct (otherwise, subjective sensations would turn out to be *identical* with the objectively existing matter), then its implications and the way of argumentation are logically defective. Of course, Mary will not “see” redness, when she leaves her black-and-white (-and-grey) room and enters the colorful external world. This is because she did not develop the *concept* of redness during her life, as she lacks the integrative and associative structures corresponding to this concept. Therefore, she is unable to “comprehend” and “grasp” mentally the quality of redness. After the first visit in the external world, Mary will only see the appropriate intensity of greyness, corresponding to the degree of saturation of red color, just like in the black-and-white TV. This grey shade, however, will not differ in her subjective feeling, at least initially, from the grey shade corresponding to green color of the same intensity (“darkness”). The fact whether Mary will acquire the ability to differentiate and perceive colors and to develop the concept of redness (and, of course, of other colors) depends on the flexibility of her neurological mechanisms when she is adult and has fully-developed neural network. Probably, she will never acquire the ability to “see” colors efficiently (or at least as efficiently as other adult people). Multiple neurophysiological observations and experiments suggest this. For instance, a cat raised since its birth in a room with only vertical strips painted on its walls and everything else will have the ability to perceive horizontal strips, lines, and contours highly impaired, when it is released into the normal world. An adult person, who was born blind, and whose ability to see is restored, perceives (at least initially, before he/she forms appropriate integrative and associative structures, corresponding to sensations and concepts) only an incomprehensible chaos of sensations instead of normal images.

To sum up, both concepts in the conceptual network and neurons in the neural network mean by *connotation*, by reference to other elements of the network (concepts/neurons), as conceptual network is a “result” of the activity of the neural network. This simple fact has far-reaching implications, concerning the basis, nature, and content of human consciousness (psyche). The functional complexity of the neural network, determining to a large extent the kind of the dynamic complexity of the conceptual network, significantly restricts the range of possibilities concerning the essence of mind and (self-) consciousness. However, too close analogies between these networks should be avoided. For instance, one single neural cell (or a simple complex of such cells) does not correspond to

one sensation (“emergent *qualé*”) or concept, as one could suppose. A sensation/concept constitutes a derivative of a complicated dynamic complexity of the neural network, which in most cases (at least in the case of concepts) is not strictly localized within any particular small area of the brain. The neural networks at the basis of various concepts partially interpenetrate each other. It may seem a contradiction that the neural network composed of discrete neurons underlies the continuous in its essence conceptual network (for instance, a concept of “blue” is to some extent vague, does not have sharply fixed limits; Korzeniewski, 2013b, 2014). However, even relatively simple neural networks, for instance those forming integrative structures in the visual cortex, are composed of a huge number of neurons. The complication of the neural networks underlying the concepts that “participate” in the processes of thinking and consciousness is much greater. The discreteness of particular neurons is obliterated at the level of the functioning of the brain and psyche, similarly like spots on a photograph (or computer monitor) are perceived as continuous objects, although they are composed of discrete grains (or pixels), as these grains (pixels) are by several orders of magnitude smaller than the dimensions of spots. Additionally, the intensity of signals transmitted by axons, proportional to the frequency of impulses, varies in a continuous way.

4.3. Conceptual Network, Sensory Data Integration and Association, and Cognition

The most basic categories in which we perceive the world result from the mechanisms of integration and association of stimuli and sensations in our brain in such-and-not-another way. Physicists frequently use the so-called phase-space, rather than the ordinary three-dimensional space, to describe the behavior (evolution) of a complex (system) of particles (atoms, molecules). The phase-space for one particle is six-dimensional, as three dimensions determine the space coordinates of a particle, while the remaining three dimensions: the coordinates of the vector of its impetus. In a system containing many particles, the number of dimensions describing this system in the phase-space is equal to the number of particles multiplied by six. It is extremely hard for the human brain to imagine such a space (like, for example, the curved four-dimensional space-time). Mathematicians/physicists predict its properties using the appropriate mathematical formalism, which is a form of a very specialized language. However, they did not invent the phase-space to make ordinary mortals feel stupid, but because it is much more *useful* for some purposes than the ordinary three-dimensional space. It is because of usefulness that biological evolution shaped our seeing of the world, and thus the structure of our conceptual network, in categories of space and time, matter, discrete objects, and causality. Therefore, there is in principle no obstacle to suppose that some unknown creatures perceive the world in phase-space categories. This means that the phase-space would be for them a primary, “visual”, “direct” manner of seeing reality, while they would have to make a considerable effort of mind and mathematical skills to familiarize with Euclidean space, as we familiarize ourselves with the phase-space. The

“world” of such creatures (this means: its representation in the conceptual network of those creatures) would be completely different from our “world”.

The so-called “facts” of the world, and also the general way of seeing it, are a derivative of our cognitive apparatus, a part of which is language (Korzeniewski, 2013b). Even the most fundamental properties of human perception of reality are not obvious and unique. This fact can be easily seen when man is compared with animals. Our most developed sense is the sense of vision. The perception of an image is the fundamental property of our seeing. If we look, for instance, at the picture *Mona Lisa*, then we see in it a pattern of some colorful spots, forming a portrait of a certain female in black, and, first of all, the most famous and puzzling smile in the world. Of course, fascination with a smile of a woman in mourning has first of all cultural roots. The fact that in the picture we perceive a person at all, results from the fact that we are humans—a Martian would not probably be able to read even this information. However, at the first look, at least one thing seems unquestionable, namely that there “objectively” exists in the portrait an arrangement of colorful spots which can be received by each organism, having at its disposal the faculty of vision (such organisms could eventually possess an organ of sight with a smaller resolution, which would make these spots less clear and more blurred).

Let us now look at *Mona Lisa* with the eyes of a frog. A frog first of all perceives movement, and therefore a portrait hanging on a wall would remain to it a homogeneous light (or dark, or “neutral”, or not perceived at all) background. On the other hand, a fly flying by against the background of the picture, that would be hardly noticeable for us, would release a sudden reaction in the brain of a frog as the only object perceived! The discussed amphibian has an eye that is built similarly to our eye. It is sensitive to a similar range of electromagnetic radiation and focuses a picture on the retina with aid of a lens (this similarity does not have to take place at all in the case of creatures from other planets—it certainly does not take place in the case of insects¹⁰). Consequently, the same spatial distribution of photons of different wavelengths causes in both cases a similar spatial distribution of stimulation of photosensitive cells in the retina located on the bottom of the eyeball. The reason that a man and a frog perceive something completely different lies in the completely different *manner of integration* by their brains of signals coming from the retina. Simplifying the matter greatly, the human brain has a larger tendency to produce pictures based on the intensity of stimuli received from different regions of the retina. The human sensory cortex is very sensitive to contrasts in the image, that is, to different stimulations of the neighboring in space rods and cones. On the other hand, the brain of a frog is prepared to record the derivative of the intensity of these stimuli in time¹¹. In

¹⁰Insects receive a range of colors from ultraviolet to orange, while humans—from violet to red. They have a complex eye, built of simple eyes (ommatidia), completely dissimilar from our eye. They also see the polarization of light, which is imperceptible for us.

¹¹The difference between a frog and a man is not at all as drastic as this simplified description might suggest. A human also has a certain preference for movement perception, especially at dusk and at the margins of the field of vision.

other words, it receives mainly not the intensity of stimulation of some group of photosensitive cells, but rather a *change* in this intensity in time, that is, the fact that a signal was arriving from a given receptor, but it is not arriving now, or inversely. Generally, the brain does not “see” the same as what the eye sees. Signals coming from the retina can be stopped or integrated and transformed in various ways. Of course, this also applies to other senses. The mechanisms of processing signals from receptors, and the physiology of the receptors themselves, are so deeply imprinted in the most fundamental categories of our thinking and seeing of the world, that we willingly regard them as the properties of this world itself. This can be easily understood when we consider for instance the representation of the external world in the conceptual network of a bat that forms this representation mostly through echolocation (Nagel, 1974).

Even in the case of “normal” seeing, that is, of seeing predominantly an image, the grouping of some complexes of stimuli into “facts” is a derivative of the integration and processing of these stimuli by our mind. We can imagine creatures whose description of the world does not possess categories corresponding to our concepts of space, time, matter, separate objects, and causal relations. These creatures might not be so well adapted to live in the real world and to explore it. However, it cannot be excluded that they would do equally well, or even better. Their logic would differ from our logic, for instance be a fuzzy logic, and even “reality” would mean something completely different for them. We are not able to find even a single, most elementary property of our mind, about which we could claim that it is an objective property of the world. Of course, some convergence, similarity of concepts to “real” facts, and aspects of the world would have to be imposed by biological evolution as a condition of the purely instrumental efficiency of living in the physical reality. Nevertheless, similarity does not mean identity. Matter, as we know and perceive it, does not matter much.

Stimuli (sensations) coming from sensory receptors constitute the primeval “substance” from which concepts are created. They are a certain form of stimulation of complexes of neurons with a characteristic spatiotemporal pattern. The structure of neural connections in a given part of the brain, for instance in the visual cortex (and also their communication via the visual nerve with photosensitive cells in the eye), ascribes a given complex of impulses to a visual sensation and, for instance, not to a hearing of sounds¹². The structure of connections (in the visual cortex in the case of the sense of sight) also decides whether a given (broadly understood) “picture” has mostly a spatial character or whether it is focused on movement perception. In turn, neural structures of a higher order, within which sensations are associated according to determined patterns, underlie concepts, namely primary concepts. Association on a still higher level is the source of secondary concepts. Overall, the “substance” of all concepts is a deriv-

¹²If one cut the auditory nerve leading to the brain, to the auditory sensory cortex located in the temporal lobe, and connected it to a cut nerve leaving the eye, then the portrait of Mona Lisa would be received by the consciousness as a cacophony of sounds.

ative of sensations and their processing by “higher” centers of the brain. It should be stressed, however, that sensations themselves constitute sets of neural impulses received from receptors that have been integrated by, partly inborn, neural mechanisms.

Of course, we do not “perceive” consciously all the sensory pictures (sounds, flavors) co-creating a given concept that appears in our consciousness, just as we are not aware of all the connotations of this concept with other concepts. This cannot be done without grasping mentally one’s entire conceptual network, together with all memory records, which is of course impossible (due to, at least, its size and the fact that many neural processes and memory records are unconscious). Thinking about a horse, we do not recall all the horses we have seen in our life, or all the information about the anatomical structure and physiology of the horse, the fact that it is built of atoms, its taxonomic position, evolution, manner of breeding, horse races, and so on, although it is the whole complex of these pieces of information that conditions our understanding of the concept “horse”.

What the eye “sees” through the stimulation by photons of its light-sensitive cells is not the same what the brain “sees” (this concerns also all other senses). For this reason, the complex of signals reaching the surface of the retina cannot be in any case identified with the picture that appears in our consciousness. These signals already undergo significant processing in the retina itself and, afterwards, in the receptor (sensory) part of the brain cortex (the visual cortex in the case of the sense of sight located in the occipital lobe and parietal lobe of the brain cortex).

Stimulation of visual cells by absorbed photons is completely equivalent to the stimulation of other visual cells. All cells are identically predisposed “at the input” to form a picture, similar to pixels in the electronic matrix of a digital camera. In both cases, the “stimulation” of a photosensitive element constitutes, as a simple physicochemical process, a direct consequence of absorption of a photon, and therefore the arrangement of the “stimulated” points on the retina or the electronic matrix (that is, what we can call the “primary picture”) corresponds simply to the spatial differentiation (in the plane of the retina or matrix) of the stream of photons falling into the eye or a camera lens.

However, this equivalence of stimulation of visual cells is lost in the above-mentioned stimuli processing. The information coming from some visual cells becomes, *ex post*, more important, or has a different “meaning”, than the information coming from other cells. It is not of course determined in advance which of the receptor cells acquire greater “importance” or a particular meaning at a given moment. This depends first of all on the spatiotemporal context of the stimulation of a given receptor cell and other receptor cells (in the same or different sense organs). For instance, the importance of the stimulation of a given light-sensitive cell in the retina, as well as its later “meaning”, depends on the stimulation of the neighboring cells (or its lack). It can change in time, depending again on the stimulation of neighboring receptor cells. As discussed below,

the information concerning the stimulation of a cell “situated” along the contour of some colorful (or dark on a light background) spot becomes more distinguished or “privileged” than a signal from a cell “situated” within this spot (for the present, I understand here a colorful or dark spot in a purely physical sense, as a beam of photons of the same wavelength falling on some area of the retina). This is related to the preference of the brain to extract *differences* in the stimulation of neighboring cells (but also, in the case of movement or, more generally, change perception, differences in the stimulation of the same cell in neighboring moments in time).

In short, the meaning of the data coming from a given visual cell depends on the spatiotemporal “context” formed by the data coming from neighboring cells. Therefore, the discussed “evaluation” of information occurs not within a single receptor cell, but at the level of the collection and integration of stimuli from many receptor cells. The picture reaching the “deeper” (in the functional sense) layers of the brain cannot be equivalent to (identical with) the picture appearing in the plane of the cones and rods of the retina. While the picture on the retina corresponds to a photograph made with a camera, “faithfully” reflecting the external reality (or at least the two-dimensional distribution of photons “emitted” by it), the subsequent multi-stage integration and processing of the data can extract certain properties from this picture that are desirable for various reasons (related to the purposefulness of the brain functioning and, ultimately, to the evolutionary fitness of the individual). For instance, contrasts in the “primeval” picture are distilled, objects in the background are blurred, and fragments of seen objects are completed with lacking fragments. Some “patterns” of the picture on the retina are preferentially selected in the process of integration of sensory stimuli and undergo extraction, while other patterns are treated as secondary, less important ones. Therefore, the information coming from the receptor cells in the retina becomes evaluated. Such privileged integration strategies applied to sensory stimuli can comprise movement perception, extraction of individual objects, perception of vertical or horizontal lines, higher sensitivity to certain ranges of the electromagnetic spectrum, extraction of well-known patterns corresponding to possessed concept (for instance “a horse”) and ignoring, at least temporarily, unknown patterns, and so on. These rather elementary mechanisms of sensory signal processing overlap with higher-order mechanisms, which exploit the accumulated memory records concerning past experiences, perform association with signals coming from other sensory organs, coordinate the function of effectors, and finally—are related to the autonomous activity of the brain, which corresponds roughly to the processes of thinking.

The influence of the mechanisms integrating signals from receptors on the very nature of our thinking and cognition is, in my opinion, enormous and commonly underestimated. *The most fundamental categories of viewing the world come from the way in which our brain processes stimuli from receptors.* (These categories are equivalent to some complexes of significative axes, differentiating the structure of our concepts). There are two basic aspects to be con-

sidered here. The first of them is the relative spatial arrangement of receptor cells in sensory organs. The second is the integration of impulses coming from these cells. Our thinking in the categories of three-dimensional space, for instance, is a direct derivative of the fact that two flat retinal pictures in our eyes, whose vision fields overlap almost completely, represent the same objects seen at slightly different angles (binocular seeing). A comparison of these pictures produces the depth effect, thus enabling our brain to “add” the third dimension to the two dimensions fixed by the plane of the retina¹³. It can be supposed that animals (e.g., a cow) with vision fields that do not overlap have their ability to perceive the world in three dimensions significantly impaired. On the other hand, we do not have the slightest idea what the most elementary categories of seeing the world used by insects, possessing complex eyes, or by bats that obtain the picture of the surroundings mainly through echolocation (Nagel, 1974), are. Most probably these categories completely escape our possibilities of comprehension. Therefore, our manner of seeing the world is certainly not the only one possible. It is based on a certain kind of structure of sensory organs as well as on mechanisms of signal integration—both shaped by biological evolution. It is simply devoid of any sense to deal with ontology and epistemology, and also with philosophy of mind, perception, and language, without knowing these mechanisms and the higher-level cerebral processes of association; just as it had no sense to study the nature of matter and time before the origin and development of modern physics. For, the status of concepts in our psyche and the resultant cognitive limitations must constitute the ultimate starting point for any further reflection.

Let us now look—superficially and fragmentarily—at how some of the basic categories of our view of the world, that seem completely obvious and irreducible to simpler components, or even absolute (see for instance Kant’s absolute categories; Kant, 1999), result from the ways of integration of the primary image that appears on the eye’s retina.

One of the fundamentals of perceiving reality in *spatial* categories consists of joining the signals from (groups of) photosensitive cells stimulated by light in a similar way, different than the way of stimulation of the surrounding photosensitive cells, into *one object*, if these cells are situated *close to each other* in the plane of the retina and not scattered disorderly over its entire area. This means that a special informative value is attributed in this case to a stimulation signal coming from such a cell that neighbors other stimulated cells (although most “distinguished” cells lie on the contour/edge of the identically-stimulated area). Although the primary picture on the retina is two-dimensional, its appropriate processing (e.g., taking into account perspective or a comparison of pictures coming from both eyes) carried out at a slightly higher level of integration makes our seeing of the world principally *three-dimensional*. We have good reasons to

¹³The “perception” of the world in three-dimensional space is also determined by the mechanisms integrating visual images at higher levels (taking into account, e.g., perspective), ways of integrating data coming from other senses, and the pattern of muscle contraction stimulations adjusted to moving around in this space.

suppose that organisms “perceiving” only two dimensions (or, in the simplest cases, no dimensions at all, simply reacting to light/darkness) exist. Moreover, there is no principal reason that would forbid certain organisms to receive reality as a four-dimensional curved space-time or a six-dimensional phase-space. Therefore, our three-dimensional “Euclidean” seeing of the world is not obvious at all.

Movement perception—that is, the registration of changes in the intensity of a photosensitive cell (group of cells) stimulation in time, rather than of the absolute value of this intensity or of spatial contrast of stimulation—can be regarded as an important factor enabling us to perceive the *flow of time*. The importance of information about the stimulation of a given cell increases significantly if this cell was not stimulated before or, inversely, when signals from it suddenly cease to come after a period of persistent stimulation. Not only a receptor cell itself, but also some complexes of neural cells are engaged in such “temporal memory”. It seems that many primitive organisms receive the current status of the surrounding environment (for example a presence of some substance in the sea water or soil) and react adequately, while they do not pay attention to sudden, but short-lasting changes of this status. Such organisms are handicapped, from our point of view, in their ability to perceive time. Other organisms, such as the above-discussed frog, have firm predispositions towards seeing movement rather than a picture. Therefore, it can be said that the world of this animal is in a sense rather temporal than spatial (the clarity of this example is a little disturbed by the fact that both temporal and spatial components of the “frog reality” seem to be much more reduced than their human counterparts; therefore, while speaking about temporally biased type of perception in a frog, we mean only a relative contribution of these components).

Another elementary property of visual stimuli integration is the disposition to perceive *contours*, that is, borders between two groups of photosensitive cells, when each group is stimulated in a different way. The relatively simple neural mechanism responsible for this phenomenon is the so-called “lateral inhibition” (Müller et al., 1995). For obvious reasons, this enables us to distinguish *lines*. A contour is “extracted” from the primary image on the retina when cells that adjoin each other in a given direction are similarly stimulated, while cells that adjoin each other in the perpendicular direction are stimulated differently. Therefore, the preference for distinguishing contours (and lines) is located first of all on the side of stimuli integration mechanisms in our brain, and not on the side of the “objective” world, or even of the primary picture on the retina.

Cells in subsequent areas of the visual cortex (especially in V1 area), integrating signals coming from the retina, are arranged and connected in such a way that we have a strong inclination to perceive *straight lines*. (This is important information for philosophers convinced about the existence of Platonic mathematical ideas). This is suggested by studies on the visual cortex of a cat (different neurons in the visual cortex are stimulated when straight lines with a different inclination are viewed by an eye; lines with similar inclinations activate adjacent

neurons in the visual cortex) (Crick, 1995). No wonder, therefore, that the appearance of Euclidean geometry significantly preceded in time the appearance of its non-Euclidean counterparts. (I leave aside the fact that the human mind *is* able to produce the concept of a straight line. Perhaps some rational insects, with their complex eyes, would not be able to form such a concept, producing instead other concepts that would be incomprehensible to us. Thus, one can ask: are there two different worlds of Platonic ideas—one for us and another for insects?).

Signal processing, related to extraction of contours, tends to separate *discrete objects* from a more or less continuous picture. This is the source of, on the one hand, our inclination to divide the world into sharply separated facts and categories, which finds expression at least in the discrete nature of language (Korzeniewski, 2013b), while on the other hand—of our need to create the concept of a *number* which is indispensable to integrate further a picture composed of objects distinguished in such a way. (I see here clear implications for the philosophy of language and mathematics). The roots of *causal relations*, or more broadly of *continuity in time*, can be seen as a result of joining *into one object* of a spot translocating in the vision field in such a way that it occupies *neighboring locations in space in subsequent moments in time* within the “picture” on the retina, and does not, for instance, move chaotically over the entire field of vision. This is why a flying bird in subsequent time moments appears to us as one object, while this does not concern chaotic spots on a noisy TV screen with a spoiled aerial, or a group of birds at a given moment of time.

Therefore, there is probably no doubt (at least in my opinion) that distinguishing such categories as time, space, matter, cause, or a discrete object belongs completely to the domain of the manner of perceiving stimuli by our brain. This does not mean that nothing corresponds to these categories in the external world, but only that they are arbitrarily chosen (by biological evolution) approximations of some aspects of reality—primary and fundamental for our mind—that do not have to be “objectively” fundamental. Moreover, the kind of adherence of our world picture to the world itself will always remain to large extent a mystery, due to cognitive limitations imposed by the structure of the conceptual network. In this sense, the discussed categories lie rather on the side of our mind and not on the side of reality “in itself”.

I would like to emphasize once again that the mentioned manners of sensory stimuli processing are not yet concepts—for the reasons enumerated above—but some predispositions, semantic axes that determine the essence of originating sensations and concepts formed on their basis, and directions of stratification of senses. Many of these mechanisms (and presumably all of them functioning at the lowest levels of integration) are inborn mechanisms, fashioned in the form of functional structures of the brain during embryonic development, before any stimuli reach the brain (with a few exceptions). Concepts, on the other hand, are formed based on the content of sensations “passed” through these integrating structures.

Many concepts are too abstract (this applies first of all to secondary concepts) for their direct connection with the “sensory structure” of the substance of concepts to be easily tracked down. A greater role in the creation of these concepts is played by higher-order mechanisms of integration and association of other concepts—the background of thinking as well as, more generally, of psyche—referring to memory and to the already possessed picture of the world. These two components, namely immediate processing of sensory stimuli and integration of more elementary/particular concepts at a higher level, exhaust *completely* the neurophysiological background constitutive for concepts. The “sensory component” predominates in primary concepts, while the “associative component”—in secondary concepts. Beside them, however, there is (in my opinion) no place for any purely “spiritual” element, for anything at all (like, for instance, qualia). *Concepts are (in neurophysiological terms) completely reducible to integration and association of neural signals occurring at different levels.* Their essence and sense come from a given concrete *manner* of processing imposed by evolution—first, biological evolution, and then socio-cultural evolution. On the other hand, it is not possible to explain completely the psychical form, subjective “content” and mental *meaning* of concepts appearing in (self-) consciousness by means of the conceptual apparatus of neurophysiology.

This situation seems to be analogous—to a large extent—to the emergence of biological purposes and senses from the physical level. Although functioning of living organisms is “nothing but” a certain manner of carrying out physico-chemical processes, it is impossible to explain the essence of life and evolution referring exclusively to physical-chemical-thermodynamic terminology. There is a need for the additional conceptual apparatus of cybernetics and information processing that does not follow in any necessary way from the physical description of the world (Korzeniewski, 2001, 2005, 2013a). Cybernetics is the only formal science able to probe to the very heart of the essence of life (the living individual).

All the above-presented examples of simple mechanisms integrating sensory stimuli seem to suggest univocally that the meaning of receptor cells is realized by connotation, as in the case of the meaning of neural cells. In particular, a given cell is not a visual cell (only) because it reacts to light, but first of all because the whole nervous system *treats* it as a visual cell. The nervous system is a big network, some endings of which—the ones that have “loose ends”, not connected with other elements of the network (commonly called sensory receptors)—are stimulated in different ways, or rather transform certain sets of external signals that reach them into neural signals and transmit them to the sensory cortex. The motor cortex transmits neural signals to effectors (muscles) that also constitute, in a sense, “loose ends” of the neural network, where they are transformed into purposeful actions (physical activities such as locomotion, manual manipulation or speech generation) that do not possess the neural nature (Korzeniewski, 2010). In a sense, our psyche and (self-) consciousness can be reduced to a certain determined manner of processing neural signals at different, particularly the highest, levels of integration. Nevertheless, this is the only

aspect of consciousness that can be seen from the biological level. It explains what the *principle according to which* the neural network underlying psyche works is. It is not able, however, to say anything about the *subjective content* of psychical senses.

Having supplemented the connotative character of the conceptual network with its, more or less directly, sensory character, I would like to return now for a moment to philosophical consequences of the discussed concepts. All opinions and statements (including philosophical ones) can come into being in our consciousness only and exclusively as elements of the conceptual network (their formulation within the syntax of language constitutes a secondary property, which is discussed above). Therefore, they cannot say anything that exceeds—either in *scope*, in *manner* or in *essence*—what is allowed by the *connotative* nature of the conceptual network as well as by the sensory-integrative-associative origin of concepts.

Everything that was said above additionally enhances the thesis that the structure of the conceptual network does not allow us to proclaim truths that are absolute in any understanding (Korzeniewski, 2014). As mental senses can function only at the psychical level, they simply disappear once the functional structure of the neural network is destroyed. If there were no thinking beings in the Universe, no psychical senses would exist. Similarly, there is no basis allowing discussion about the purposes of biological evolution at the physical level, beyond the functional structure of living organisms. More importantly, the structure and substance of the conceptual network is completely different from the structure and substance of the world it represents (as the essence of a spider's web constitutes something completely different from the substance of the sculpture it covers), and their reciprocal adherence can be at best imperfect. This implies that psychical meanings—as they are a part of the conceptual network—are of a completely different nature than anything that is *beyond* them, and therefore beyond the psyche (that is probably the source of the subjective inclination to sharply separate “spirit” from matter). Nevertheless, we have direct access only to the representation of matter in our mind. The external (in relation to the conceptual network) reality (*noumena*) can be only known approximately for two principal reasons. First, we cannot represent the world with *infinite* accuracy, which is due at least to the limited capacity of our mind (and the neural network underlying it). Second, the very “substance” of concepts will always remain dramatically different from the “substance” of the world “out there”. As the above-quoted analogy shows, it is not possible to infinitely tighten the mesh of the spider's web in order to reflect the smallest details on the surface of the sculpture. Nor will the spider's web become *identical* with the surface (and the substance) of the sculpture. Without this identity, the conceptual network can only pretend to be a certain *model* (representation) of reality, reflecting (approximately), as any model, only some aspects of what is modeled. For all of the above reasons, a formulation of any statements that are to pronounce about absolute truths—fully autonomous and non-relativized to anything beyond them—

selves—is from the start flawed with a logical error. Nevertheless, a large part of philosophy keeps committing this error.

However, in the present considerations we are focused not on the difference between matter and the mind, but between the representation of matter (physical world) and mind (subjective psyche, self-consciousness) within the conceptual network.

4.4. Conceptual Network, Language, and Cognition

Our seeing of the world is created, shaped, and determined not only by the mechanisms responsible for integration, processing, and association of the sensory signals arriving from receptors, but also by (the grammar and general structure of) language (Korzeniewski, 2013b). The “facts of the world” as well as linguistic names designating them are commonly assumed to have an independent and fully autonomous existence (which finds its culmination in the philosophy of early Wittgenstein; Wittgenstein, 1921). However, in my opinion, facts are constituted to a large extent by human language (and by cognitive structures in the brain underlying it, as well as by the integration of sensory signals discussed in the previous sub-section) from the “chaos”, or rather “nonsense”, of sensations that reach us (Korzeniewski, 2013b). The fact that we normally treat a person named John as a “fact of the world” results from the manner of integration of these sensations. “Facts” are products of our mind, and not objectively existing categories of the world. Therefore, language uses names that do not have well-determined designates. This opinion stands in obvious opposition to the philosophy of early Wittgenstein (Wittgenstein, 1921) and a part of analytical philosophy (Austin, 1964; Searle, 1984), where the only possible and necessary structure of names designates the set of autonomous and absolute facts (existing outside our mind).

The “fact-creating” role of language determines to a large extent the essence and structure of (the conceptual network of), on the one hand, our mind, psyche, and self-consciousness and, on the other hand, of the whole of human culture, including science, fine arts, philosophy, religion, and the sphere of common senses. Language shapes to a large extent the form and content of human thinking. Science differs from, for instance, philosophy or religion by its methodology, which ensures congruence between linguistic (and conceptual) structures and the structures of the world. However, this congruence is far from perfect and this fact real science from its idealizations. The error of absolutization consists here of a naïve belief in a *real* and “sharp” existence of such objects described by science as the orbital of an electron, probability wave, gravitational force, or biological species, being general concepts. The same also applies to a particular electron, the planet Earth and a given, concrete individual of alga or a canary (see Korzeniewski, 2013b). In this case, the qualification “real” does not mean an existence totally outside our psyche, which I by no means intend to negate, but an existence in the forms, categories, or even values produced by the human mind. At the same time, I do not share the original opinion of Immanuel Kant that “things in themselves” (*noumena*) are completely non-cognizable (Kant,

1999). If our categories had nothing in common with the real structures of the world, we would not survive as a biological species, and we would not achieve such spectacular success in the natural sciences.

According to some (especially analytical) philosophers who prefer linguistic thinking *modo* Wittgenstein, the known is separated from the not-known by a clear boundary—the known is the already ready part of our knowledge, grasped in linguistic structures and therefore true for ever, while the not-known is the whole rest, waiting to be grasped in this way. On the other hand, according to the conception of the conceptual network, nothing is fully true or false in our picture of the world (Korzeniewski, 2014). Our cognition is a continuous process, which consists of the refining (or rather: co-refining) of concepts, and in co-development of apparently distant areas of the conceptual network that can present in a new light, or even change completely, these elements of our knowledge that we regard as unshaken and obvious. Therefore, the process of cognition occurs here gradually and never leads to completely certain, absolute knowledge. Even logic, which could seem to be an absolute and autonomous gauge of the unity of at least the most basic properties of our mind (language) on the one hand, and the objective reality—on the other hand, appears to be nothing more but an evolutionary-grounded mechanism by which our brain treats stimuli from the environment (Korzeniewski, 2013b, 2014).

4.5. Conceptual Network and External World

The general functional structure, the very nature of the conceptual network, led—when man turned towards philosophy—to an “evolutionary trap of consciousness”. Our (self-) consciousness (mind) was shaped in the processes of biological evolution in the “objectively” existing world in such an (only possible) way that it is not even able to prove with absolute certainty the existence of this world. For it is not possible to determine in a sensible way the truth value of a “hypothesis” concerning the existence of something like the external reality (this is one of the reasons why idealistic monism originated in philosophy). Each consequent logical analysis of the concept of “the world” leads to absurd conclusions, and implies that this concept is empty, devoid of its designate, as the “external world” cannot be in any way distinguished from a certain area of our conceptual network containing its “representation”. As we have direct access only to the conceptual network, the existence of anything beyond it, “out there”, is in a sense only an unjustified, excessive hypothesis, forbidden by the Ockham razor principle. It seems that matter does not matter. On the other hand, if everything we have direct access to is the “substance” of our mind that is the conceptual network, then the concept of mind is devoid of any meaning or sense, as “mind” simply signifies “everything”. As such, the mind can be completely ignored: we should not mind it.

These problems result directly from the fact that evolution shaped our minds to enable us to hunt for mammoths and not to develop philosophy or science. The development of culture was not planned by the essentially indifferent to cultural senses (conceptual network) biological evolution.

Nevertheless, the “hypothesis” concerning the existence of the external world is very useful in the operational sense, that is, in categorization and manipulation of the entire spectrum of phenomena which are accessible to us. Therefore, it is useful for practical purposes. One can adjudicate about the absolute existence of the “external world”, but also about the absolute existence of the “internal mind” (internal in relation to what?) only in the instrumental sense. As discussed above, within our psyche the “mind” (self-consciousness) corresponds to the fragment of the conceptual network that is directed on itself, while “matter”—to the fragment that is not. Nevertheless, both remain parts of this network.

4.6. Conceptual Network and Mathematics

The nature of the conceptual network also determines the status of mathematical concepts, concerning such “objects” as number, point, straight line, derivative, integral, curved space, vector, and tensor, as well as relations between them. The Platonic tradition holds an idealistic assumption of existence of these concepts (objects, relations) beyond both the human mind and the material world (Barrow, 1992). According to this tradition, the role of mathematics is to discover the world-and-man-independent structure of mathematics. However, such a hypothesis seems to me to be excessive and unnecessary. A competitive hypothesis can be formulated within the conception of the conceptual network. In this formulation, mathematical objects, and relations between them, would refer to concepts within our mind representing some aspects of the real world when they are abstracted from accidental properties. These concepts constitute building blocks that can be arranged in different combinations, allowing one to create different mathematical systems. Such systems can be created because the building blocks fit together in various combinations, because of their “internal” properties (structure), while in other combinations they do not, yielding either internal coherence of the system or a contradiction. Only a few of these systems are used by us to describe the physical world, while other systems are “separated” from this world. But this separation is only apparent. It constitutes an introspective impression of our mind, because concepts of mathematics—its building blocks (both mathematical objects and the relations between them)—come from the material world. In the same way as we create “unreal” mathematics, we could, possessing appropriate knowledge, create “unreal” biologies by projecting non-existing living organisms built of already existing building blocks: chemical elements and compounds, or even cells, tissues, and organs. A different attribution of amino acids to nucleotide triplets (codons) in the genetic code could serve as a simple example. Again, because of the internal properties of the building blocks, not all their spatial, temporal, and functional combinations would lead to the formation of an “operative” biological individual, “equipped with” appropriate purposeful structure and function, allowing its survival and reproduction in the natural environment. Just as systems within mathematics can be verified by demonstrating their correctness (and coherence) or falsified by proving their internal contradiction, so the constructed organisms would be evaluated through their functionality or dysfunctionality (in a given concrete physical-biological

environment). Therefore, there is no need to assume the existence of mathematics outside the structure of the world and conscious minds. The exactness, power, and elegance of mathematics testifies that the contribution of objective properties of the world to the formation of mathematical concepts in our mind is huge, incomparable with any other field of human knowledge, while subjective “contamination” of these concepts by the structure of our senses and neural connections is relatively small (however, the share of this contamination is certainly different in different branches of mathematics). This contamination certainly cannot be completely eliminated (which is shown by, e.g., Gödel’s proof or numerous paradoxes related to infinity; Barrow, 1992, 2002) (see also Korzeniewski, 2013b, 2014, for discussion).

4.7. Conceptual Network and Universal Beings

The paradigm of the conceptual network being an aspect/epiphenomenon of the neural network can also show such problems as the problem of the existence of *universal beings* in a new light. Some philosophers granted these beings with the status of objects that are equally real as individual beings. Other philosophers refused them any real existence. Yet, other philosophers treated them as some conventions that allow us to describe reality in a convenient way. However, the problem disappears in a completely natural and automatic way at the level of the conceptual (and neural) network. Concepts (associative structures) corresponding to universal beings do not differ principally from other concepts and originate in a similar way. Of course, they correspond rather to secondary concepts than to primary ones, and therefore their essence is determined to a large extent by the manner of processing and association in the brain of signals on a high level of integration (secondary associative structures). Like all other concepts, however, they have meaning through connotation, and a human acquires them gradually, during his or her individual development, by assimilating inductively repetitive complexes of sensory impressions and concepts. It seems futile and devoid of any sense to speak about a manner of “existence” of universal beings different from the existence of (secondary) concepts corresponding to these beings. Nevertheless, it is not possible to strictly demarcate universal concepts and individual concepts. In the ultimate instance, the hierarchy of the universality of concepts gets completely flattened and all concepts become simply elements of the conceptual network invested with equal rights (Korzeniewski, 2014).

To sum up, the question of the existence or non-existence of general (universal) beings is reduced to various (unconscious) interpretations of the manner of formation and the essence of secondary concepts. The unresolvable (or rather apparent) character of numerous philosophical problems is a direct derivative of our neurophysiology.

4.8. Biological Cybernetic Individual vs. Psychical Cybernetic Individual

The essence of life (living individual) cannot be expressed in purely physical

terms. The only formal science that can reach to the heart of the essence of life is cybernetics. The living individual is a very distinguished level in the hierarchy of the organization of life, as it is a self-dependent entity “taking care” of its survival and reproduction, the unit of selection and subject of biological evolution (“selfish genes” proposed by Dawkins, 1989, are not autonomous in performing this task and must cooperate with other genes). The biological (living) individual was defined in cybernetic terms as a network of inferior negative feedback (control homeostatic mechanisms) subordinated to (being at the service of) the superior positive feedback (reproduction, potential of expansion) (Korzeniewski, 2001). In short, a living individual was argued to be first of all a homeostatic replicator. The idea of the cybernetic living individual is demonstrated in **Figure 2**. It was argued that this is a minimal possible definition and that life as we know it emerges when this cybernetic definition is confronted with the basic properties of the real world (Korzeniewski, 2005). The fundamental level of the structure and function of the spontaneously-originated life is the molecular level. It was argued that artificial life, the fundamental level of which is supra-molecular, would have to be composed of dispersed individuals containing several sub-units that are integrated only functionally but not structurally, just like an ant colony is a cybernetic individual composed of structurally separate insects (Korzeniewski, 2011).

It was also postulated that the psychical (self-conscious) individual, as characterized above, is from the formal (cybernetic) point of view strictly analogous to the biological (living) individual, and therefore a universal definition/model of an individual can be formulated (Korzeniewski, 2013a). The (biological or psychical) individual is constituted by a network of elements (negative feedbacks/control homeostatic mechanisms or neurons/concepts, respectively) that possesses the following common properties: 1) It is intentional (in the operational sense); 2) Its elements signify (have sense) by connotation (through relations to each other); 3) It contains an instrumental representation of (some as-

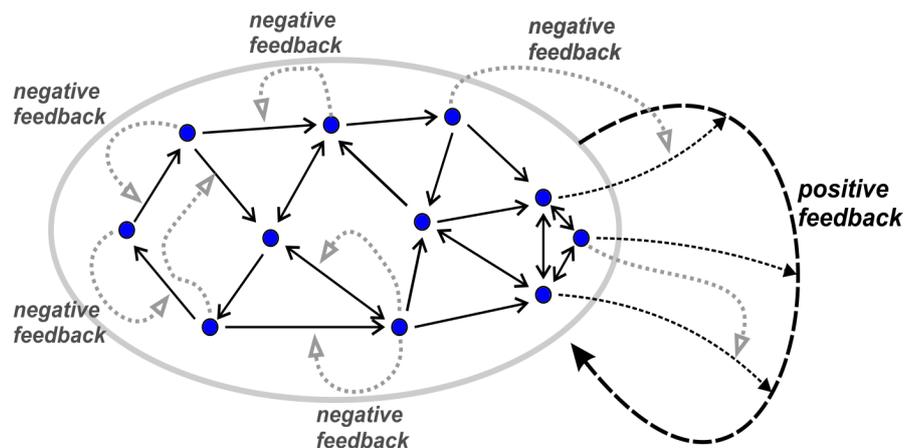


Figure 2. Schematic presentation of the cybernetic living (biological) individual as a network of negative feedbacks (homeostatic control mechanisms) directed on the survival and reproduction (positive feedback) of the individual itself (its cybernetic identity related to such-and-not-another network of negative feedbacks).

pects of) the external world; and 4) It is self-referential, that is, recurrently directed on itself (its own reproduction or representation, respectively). Thus, life and self-consciousness have deep, formal, structural similarities when viewed abstractly. Their essence is related to the special kind of complexity that exists in an equally objective (or, if somebody prefers, equally subjective) manner as space, time, and matter (Korzeniewski, 2015a).

4.9. Conceptual Network and Mind-Body (Matter) Problem

The problem of the mutual relation between the self-consciousness (mind, “spirit”) and matter (body, external world) (the mind-body problem) can serve as an example of a problem at least to some extent artificially generated by philosophy. *Interactionism* treats these phenomena as two independent beings that exert influence on one another. However, numerous arguments have been formulated to show the impossibility of a bi-directional causal relation between the considered beings (that means both body \rightarrow mind and mind \rightarrow body influence), due to their total dissimilarity (interactionism is strictly related to dualism that treats psyche and matter as two completely different, incommensurate philosophical entities). A “fifth force” (in addition to four known physical forces: electromagnetic, strong nuclear, weak nuclear, and gravitational) would have to mediate in this kind of interaction, through affecting for instance the behavior of sodium and potassium ions in axons during neural impulse propagation. No such force or effect was detected. Moreover, this force would have to be completely indeterministic, unpredictable, and chaotic (from the point of view of scientific laws) in order to constitute a background of (idealistic) free will (that is possible only within dualism; Korzeniewski, 2010). However, such a force would be completely unacceptable for any rational scientific methodology. *Parallelism* resolves this problem by postulating the parallel occurrence of material and mental phenomena, while the double-aspect theory (Nagel, 1989; Chalmers, 1997) regards them as two different manifestations of some third being. However, the first of these concepts does not explain anything, while Occam’s razor would be of use for the advocates of the second concept. *Neutral monism* says that the mental and the physical phenomena are two ways of organizing or describing the same “neutral” elements, which are neither physical nor mental (Russell, 1921). However, some elements, for instance stones, are certainly physical, but not mental. Additionally, neutral monism assumes a symmetry between matter and mind, while in my opinion the latter supervenes the former (is its epiphenomenon), and therefore is in a sense secondary in relation to it.

The point is that the whole problem was erroneously formulated from the beginning. We forget that this is philosophy that led to opposing so drastically the mentioned beings, and gave them an unquestionably absolute sense, which in fact should be recognized as equivalent to production of empty concepts. Consciousness (and matter as well) does not exist in the absolute way attributed to it by many philosophers. It can be reduced, in a sense, to a *manifestation* (epiphenomenon) of brain functioning, just as the roar of water is a manifestation of its

falling in a waterfall (or the shadow—of an object situated on a light course). Causal relation—if this term makes here any sense at all—is in this case unidirectional and leads from the brain to (self-) consciousness. (Self-) consciousness at best *accompanies* (is a “by-product” of) neurophysiological brain activity. Similarly, while the statement that a waterfall constitutes the cause of a roaring sound seems to be relatively reasonable, then, the influence of the roar on the waterfall appears to be complete nonsense. The opinion presented here has much in common with the philosophical conception called epiphenomenalism. This is suggested by the fact that here, to explain the background of the phenomenon of (self-) consciousness, it suffices in principle to describe the way in which impulses are conducted in neural circuits and the mechanisms of their integration and association as well as the general cybernetic relation of recurrent directing on itself of the cognitive center. A strict analogy holds here with the phenomenon of life, as discussed above. The spirit in its immanence constitutes something analogous to the “vital force” of living organisms, which has been recognized by biology for a long time as an empty and nonsensical concept. While I am inclined to agree that psychical senses cannot be reduced to biological senses (and all the more to physical senses), I do not see any need to distinguish (self-) consciousness (mental sphere) as some absolute being. Finally, the described conception (of the conceptual network and neural network underlying it) leads to the conclusion that it is the brain and not the mind that has causal relations in the real world.

The conception of the mental sphere presented here goes undoubtedly much further than “pure” epiphenomenalism, as it postulates *in what way* psyche and (self-) consciousness can be a derivative of some neurophysiological mechanisms functioning in our brain. Such understood psyche both is and is not reducible to a complex of neurophysiological processes. Similarly, the phenomenon of life both is and is not reducible to a complex of physical/chemical processes. Certainly, the essence of the living individual cannot be characterized in physical terms and the essence of the psychical individual (self-consciousness) cannot be formulated in purely biological (neurophysiological) terms.

Each process in a living organism is a physical-chemical process. At the same time, a certain *complex* of such properly organized processes characteristic for living organisms escapes physical terminology. Here appear aims, tendencies, and senses that cannot be attributed to inanimate matter. The question of whether these aims and senses—and therefore the essence of life (the living individual)—constitute an “objective” element of the world or a “subjective” category of our mind is devoid of any sense. It is equally objective or, if somebody prefers, subjective, as space, time, matter, objects made of it, located in space and changing in time, and so on (Korzeniewski, 2015a). This question must remain without an answer. Nevertheless, the border between objectivism and subjectivism is becoming more and more obliterated even (or especially) in the strictest natural science, namely physics. For instance, such “objective” concepts of thermodynamics as information, macroscopically distinguished state, or the arrow of

time become “subjective” from the point of view of “classical” dynamics (Newton’s dynamics, Maxwell’s electromagnetism, relativity theory, and quantum mechanics). Even considering the elements of the physical world described by dynamics (understood broadly, together with quantum mechanics and relativity theory), as a probability wave, orbital, matter, or the force of gravitation, one can doubt whether they should be attributed with completely “real”, objective existence, or perhaps they should be considered as a convenient manner of categorization and ordering by our mind of the whole accessible spectrum of phenomena. The indeterminism of quantum mechanics resulting from Heisenberg’s indeterminacy principle is probably the best-known example of subjectivism in physics (compare the Schrödinger’s cat paradox, Penrose, 1990; see also Korzeniewski, 2016, for discussion).

Generally, the content of our mind, psyche, and self-consciousness becomes increasingly objective, as neurophysiology reveals the neural background of more and more psychic processes. On the other hand, matter becomes increasingly subjective within contemporary theoretical physics, as such constructs as orbital, collapse and decoherence of wave-function (state vector) or space-time curvature equivalent to gravitation appear more and more to be creations of the human mind. Therefore, it is not possible now to fully separate the external physical world from the content of our psyche! The difference between the mind and matter does not matter and we should not mind it as much as we do.

The problem of the relation between the psychical level and the biological level is analogous to the dependence between the biological level and the physical level. *Each* psychical process—including the processes underlying (self-) consciousness—is a biological (neurophysiological) process. However, a certain *complex* of neurophysiological processes, which can be reduced to a determined pattern of circulation of impulses in the neural network, acquires *new senses*—absent at the biological level. The scheme of dynamic connections in the neural network together with the mechanisms of its functioning determine the connotative, and therefore sensory-integrative-associative, essence of the conceptual network constituting the “content” of the human psyche. Of course, not every imaginable combination of neural impulses in the brain would underlie (self-) consciousness, just as not every set of physical processes would lead to the formation of a living system. Therefore, the fundamental problem becomes *how* (self-) consciousness emerges from the biological level, and *what* kind of complexity of structure and function of neural circuits is responsible for the emergence. According to my conception presented here and in my earlier works, the general answer to this question is the same in the case of the roots of (self-) consciousness as in the case of the roots of life, namely the *relation of self-applicability* (see also Korzeniewski, 2010, 2013a, 2013b, 2014, 2015a, 2015b).

Generally speaking, a new kind of senses (purposes) emerges (can emerge) when some system (intentional network of elements meaning by connotation) starts to be recurrently *directed on itself*. In the case of biological individuals, this self-focusing is manifested as a tendency of a given identity to survive and

propagate itself. In principle, the very essence of this identity consists of a drive towards auto-copying. Therefore, it becomes an autonomous sense or aim (“in itself”) of a living individual to maintain the “value” of this “parameter”, that is its identity, at the “assigned” constant level. Let us remember that the mechanism ensuring some parameter value to be maintained at a constant level is called negative feedback. After all, it is not accidental that systems attributed with negative feedback are given the name in cybernetics: “tendential systems”. In the case of life, the relation of self-applicability consists of the fact that the adequate “parameter” (which is the biological/cybernetic identity of a given individual) tends to maintain a constant value of itself from generation to generation (Korzeniewski, 2001, 2005, 2013a).

By analogy, we can speak about (self-) consciousness from the moment the center in the brain that contains a (broadly understood) dynamic picture of the world serving as a frame of reference, segregator, and processor for perceived stimuli from the world as well as associates signals from different parts of the brain, plans future actions and undertakes decisions—also begins to “perceive” itself. At the same time, I treat the concept “picture of the world” in a purely instrumental (non-psychical) sense, that is, as a certain adequately processed and integrated complex of experienced sensations, serving as a frame of reference and interpreter for future sensations. In this way, this center containing the dynamic picture of the world and carrying out autonomous association of different signals within the brain (processes of thinking and data analyzing) becomes “aware of its own existence”. In my opinion, this resulted in the appearance of psychical senses, completely alien to the biological and physical level.

Therefore, the problem of the relation between spirit and matter (the mind-body problem) resulted—according to what was said above—only and exclusively from a confusion of concepts, that is, from granting them some arbitrary and “absolutistic” meanings without taking into account what modern science already can (or will be able to in near future) say on this subject. A completely autonomous consciousness is a superfluous being in the sense of the Occam’s razor. However, this leads to another problem. The lack of causal influence of consciousness (spirit) on the body automatically triggers the problem of the existence of (conscious) free will. Even after superficial analysis, however, one must conclude that free will in the philosophical (idealistic) sense (assuming that the mind = “spirit” is a completely different and separated from matter sort of being) does not exist. More, it is an internally contradictory concept, to which nothing sensible can correspond (Korzeniewski, 2010). Unfortunately, production of artificial problems constitutes one of the main sins of philosophy—even more, it is an important element of the essence of a large part of philosophy. In my opinion, the conventional and apparent character of the majority of philosophical problems—manifested in the production of empty concepts, in disputes concerning terminological ranges rather than senses (concepts) corresponding to these terms, or in a purely arbitrary transfer of concepts from their natural surroundings to other semantic environments where these concepts, still hidden

under the same linguistic name, become in fact different concepts (Korzeniewski, 2014)—allow me to take such position. The quite well known question of whether mathematics is created or discovered can serve as an example of the last phenomenon. I maintain that this problem vanishes the moment we realize that creation and discovery mean something different in mathematics than the creation of artistic masterpieces or discovery of new lands (Korzeniewski, 2014).

5. Conclusion

Summing up, the neural network underlying the conceptual network was shaped during biological evolution (phylogenesis) and is formed during individual development (ontogenesis) in such a way that there are two main areas of the conceptual network. The first, not directed on itself, contains the representation of the external world, physical reality, and broadly understood matter, while the second, recurrently directed on itself, forming its own representation (model) within itself, corresponds to (the content of) mind, subjective psyche, and self-consciousness. This difference, which is the directing on itself or lack of it, is responsible for the apparently complete dissimilarity of mind and matter within the human psyche; they appear to be phenomena of completely opposite nature. However, as discussed previously (Korzeniewski, 2010; 2013a; 2014; 2015a), the essence of mind and (self-) consciousness can be reduced (especially within neurophysiology) to a certain specific sort of dynamic organization (complexity) of matter. On the other hand, matter becomes (within modern theoretical physics) to an increasingly high degree, a product of the human mind. In short, matter “creates” the mind, while the mind “shapes” matter. Therefore, the discussed opposition is at least partly apparent. Matter does not matter so much and one should not desperately mind the mind. Numerous features of how humans see the world can be derived from the manner in which the brain functions. Generally, the mind-body problem as well as many other chief philosophical problems can be to a large extent reduced to neurophysiology.

Of course, these conclusions have a pronounced impact on philosophy. In particular, we must not absolutize (the meaning of) concepts and linguistic names. All meanings in philosophy (and, in fact, meanings at all) are only relative and relational, depending on the context. We must accept the fact that our knowledge and understanding of the world (both external—matter and internal—the mind) will never be perfect and absolute. This results from the connotative nature of the conceptual network, which constitutes an only approximate representation of reality. This, in turn, is a derivative of the human neurophysiology, the nature and functional structure of the neural network.

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