Chapter 4
Natural Brains and Motivated, Emotional Mind

ABSTRACT

We know that the brain is the seat of the mind. Constructing the reductive model of the conscious mind requires an indication of the laws according to which the mind emerges from biophysical processes occurring in natural brains. Because in Part I, the authors presented the theoretical model referring to the ideal structures of the imagined neural network, we now have easier task, because we need to indicate in the brains of the living beings those processes that functionally correspond to our postulates. Such suitability is not guaranteed by known processes occurring in specialized parts of the brain. The role of the primary sensory areas is a detailed analysis of sensory stimuli with specific modality. They result in analysis of the meaning of all useful stimuli and their interpretation used in various parts of the cortex. The high specialization of individual cortex areas is striking and are the result of evolutionary development of the brain. New brain structures, such as the new cortex, were added on the outskirts of existing structures, improving their performance in the ever more demanding environments, where other intelligent beings ravened. But even as we know the brain organization, we struggle to understand how it works. How neurons that make the brain work together to create the conscious mind. To discover functionally effective processes in the brain, one need to reach for the biophysical properties of the astrocyt-neural network. In this chapter, the authors suggest that some concepts of neuro-electro-dynamics and the phenomena of neuro- and synapto-genesis as well as synaptic couplings may explain the processes of categorization, generalization and association leading to the formation of extensive, semihierarchical brain structures constituting neural representations of perceptions, objects and phenomena. Natural brains meet the embodiment condition. They are products of evolution, so they have intentionality, their own goals and needs. So they can naturally show emotions, drives and instincts that motivate to act. This determines the nature of constructed mental representations. They are the subject of psychological research, which shows the motivation of pain and pleasure in the field of intelligent activities, as well as the motivation of curiosity and the need for understanding in the domain of propositional and phenomenal consciousness. They describe the way pain is felt in organisms as basic quale. The role of other qualia for "how-it-is-like to feel something" and their subjective character was explained, as well as their interspecies specificity was characterized. In this chapter, the authors present an elementary biophysical phenomenon, that is a flash of consciousness. This phenomenon is synaptic coupling

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formed in the course of learning. They justify that the stream of such phenomena is the foundation of consciousness. They also point out that the astrocytic-neural network meets all the conditions required to generate conscious sensations.

The purpose of this chapter is not to present the structure of the brain and all its processes. Many monographs and academic textbooks are devoted to this topic. Instead, as promised, we will focus on those elements of the brain structures and its processes that lead to the appearance of a conscious mind with subjective feelings, thoughts about the surrounding world, and an environmental model expressed through general, abstract, and well-defined concepts. Ideally, the mind's thoughts and understanding of the world should be expressed in a suitably complex symbolic language. The enormous knowledge of internal structure and functions of individual cerebral lobes will be invoked only when we want to indicate that some of the features and functions of our imagined brain are carried out in real brains.

Do natural brains have layered memory structures capable of remembering neural representations of perceptions and associating them into larger structures representing the image, the scene, and the model of the environment? Can semblions form representations of simple features of objects, abstract concepts, and ideas associated with mental states representing feelings and emotions? Let's start from the beginning.

Reviewing the existing knowledge about the structure of the brain and its functions that lead to psychic phenomena, which we proudly call "the mind," we can be overwhelmed by the brain's breadth and depth. Generations of neurologists have examined almost all sections of brain tissue. Chemical reactions that ensure nutrition and metabolism in the cells of the network of neurons have been tested. Dozens of variations of neurons, glial cells, and all other cells that support the consistent interaction of this entire collection in regulating the flow of information in the brain have been found. The interior of the neuron was penetrated, like the other cells of our body were. The neuron's structure, encompassing axons, long protrusions connecting neurons with distal regions of the cerebral lobes, dendrites, smaller branches growing from the neuron and connecting it with thousands of other neurons and synapses, joining sites of axon and dendrites of neighboring neurons—all of this has been sorted out. The method of connections formed from these elements of the neural network with the sense cells and muscle cells moving the body has been reconstructed. Even chemical reactions and electrical waveforms accompanying the transmission of stimuli between neurons, inside their cell bodies, inside axons and dendrites, and especially precisely on synapses and intersynaptic clefts have been investigated.

We know the basic structures of the brain, and we admire the degree of complication of morphology, physiology, and complexity of brain processes. Will we be able to identify these structures that resemble the structures and flow of information characterizing the imaginary system described in the first chapter?

MISHMASH

Guided by modern knowledge, we know that the brain is the seat of the mind. Let us recall information about the specific role of some areas of the brain. This will create a pattern of mutual connections and specializations of known brain structures that explains their interaction.

The brain is not only the central organ controlling our thoughts and behavior, but it also fulfills the more ordinary tasks of controlling processes important for our bodily life. That's why it connects and works closely with the two external circuits needed to regulate basic vital functions, maintain stability, and deliver sensory information and information for remote muscle control. Both of these circuits fulfill an important role, but they do not determine the feeling of consciousness. That is why the center of our