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Model of the Neuronal World as a Complete Explanation of Empirical Reality

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Abstract

The brain has been the subject of scientific inquiry for centuries, yet we continue to unravel its mysteries. One of the most intriguing questions is how the brain creates a perception of reality. The Neurophilosophical model of the Neuronal World (NWM) is a scientific theory that explains how the brain makes a neural model of the world and a self-model through wave synchronization of neurons in the connectome. The NWM includes illusionism, which explains that the phenomenal character of consciousness is an illusion. The NWM proposes two basic models of the neuronal world: a model of the world and a self-model created by any brain. Understanding the self-model is crucial to gaining insight into the brain's workings. The NWM refutes the notion of the existence of consciousness, explaining that this concept does not reflect the accurate picture of how the brain creates a virtual model of reality. By exploring the NWM, we can gain insight into the workings of the brain and its role in creating perception of reality, which can have an impact on various fields, including neuroscience, psychology, and philosophy.

Key Words: neurophilosophy, model of the neuronal world, neuronal world, brain rhythms, self-model, neuronal space, neuronal causality, the model of the world, Illusionism

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Introduction

The Neural World Model (NWM) is a neurophilosophical model of empirical reality, i.e., a neural model of the world and a self-model, created by the brain connectome through the wave synchronization of neurons (Nicolelis, 2020; p. 128), which offers the systematization of the activity of brain modules according to their specialization and contribution to predictive modeling of the neural world (from now on, NW).

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The distinction between this model and previous philosophical attempts to explain reality lies in adhering to the principle of sufficient basis, i.e., deducing the consequence from the base. This approach is characterized by its specificity while avoiding extremes such as Nihilism, such as solipsism, which denies the existence of objective reality, and Eternalism, which asserts the autonomous existence of the NW independent of the brain. The main problem of many philosophers who were unwittingly deluded was the attempt to deduce the foundation from the effects: this error is, in fact, the mechanism of any mistake: for example, A. Schopenhauer tried to deduce, as he believed the foundation of the world — the will — from the effects of observation (EMNW), as he believed, its objects, i.e., phenomena of the world, falling into four forms of the law of probable cause, why and has fallen into a delusion of voluntarism: the attempt of the thinker to deduce the fact of the existence of will from introspection, which in reality represents the computational model of the brain, and not the "primacy of will in the self-consciousness" (Schopenhauer, 2010).

Thus, the NW model represents a neurophilosophical model of reality based on the following principles: 1) empirical philosophy, i.e., recognition of the objectivity of reality and its independence from the brain; 2) metrology, i.e., the possibility of directly verifying each of its positions; 3) sufficient basis, i.e., justification of each position of the model; 4) illusionism, i.e., the notion that many aspects of NW are illusions that the brain needs to replicate DNA - for example, the illusion of a transparent self-model (Metzinger, 2009) that creates a false dichotomy "I — other" and thus pushes organisms to procreate through 1) dopamine system of desire; 2) opiate system of reinforcement (Kolb, 2019; p. 508). Another key feature of the NW model is its ability to refute the naive representations of the past verbalized by various philosophers: for example, the NW model refutes the notion of the existence of consciousness, explaining that this concept does not reflect the accurate picture of how the brain creates a virtual model of reality and the need to replace the notion of consciousness with a more precise and correct idea of the neural world. In addition, the NW model points to the source of the "fallacy of consciousness," the transparent self-model created by the neuro networks DMN and MNS (Metzinger, 2013).

The NW model is a powerful tool that helps us overcome the limitations of naive realism. Humans tend to believe that what we see before us is an objective reality. However, the truth is that everything we experience is created by brain activity. The NW model uses neuroscientific reasoning to relate to the world model as a copy of the original. Still, rigid frames determined by neurochemical processes limit it. Essentially, the model helps us understand that what we perceive as reality is a subjective representation created by brains. By embracing this perspective, we can open up new avenues of understanding and explore the true nature of the world around us. So, let us assume the NW model and discover the power of neuroscientific reasoning.

Neuronal world: basic models

Before starting the description, it is essential to establish the meanings of the terms used: the neural world model (MNW) is a teaching, and the models of the neural world are the modules that make up the NW. The neural world breaks down into two basic models: 1) a model of the world and 2) a self-model created by any brain, be it a fly, a shark, a chimpanzee, or a cow. The brain of all Earthlings models NW uniformly, which follows from the qualitative unity of brain rhythms in all central nervous systems (Bear, 2016; p. 230). The world model can be viewed from two levels: 1) empirical (EMNW), which contains all sensory modalities that form the EMSNW (empirical model of space), EMMNW (empirical model of matter), EMTNW (time), EMCNW (causality): for example, EMSNW splits into a) EVMSNW (visual model of space); b) EAMSNW (auditory); d) EKMSNW (kinesthetic); e) EOMSNW (olfactory); f) EGMSNW (gustatory). Precisely the same models contain EMMNW; 2) abstract (AMNW), which consists in dissociating the content of empirical models through less intensive activation of the same neural networks that mediate empirical models: for example, AVMSNW (visual) represents dissociation of EVMSNW, i.e. less intensive activation of neural networks of the visual system (not the primary visual cortex), including dorsal and ventral streams, respectively parietal and the temporal lobe. This is true for any EMNW — AMNW connection. I.e., auditory imagination (AAMNW) is the activation of the secondary auditory cortex (A2) (Baars, 2010; p. 361). This mechanism is correct concerning the dissociation of all empirical models. 68

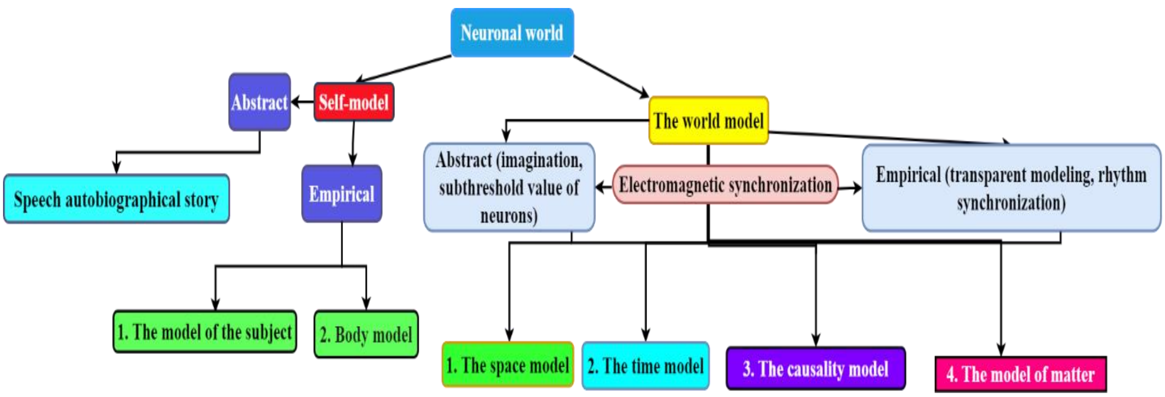

Figure 1. The general scheme of the neural world

The general scheme of NW demonstrates the differentiation of modules from basic models. Still, this separation is conditional and necessary for the most detailed description of NW. In contrast, in the brain, there is a single neural process devoid of integrity and consisting of 87 billion functional cells and quadrillion synapses, which determines the illusion of duality characteristic of the neural worlds of all earthlings.

The general principle of modeling the neuronal world

The neural world is based on the electrical and chemical activity of neurons. Still, one should not lose sight of the most important aspect that gives NW stability — the electromagnetic synchronization of “brain solenoids,” as M. Nicolelis called them. The speed of action potentials (AP) — 120 m/s is provided by a hybrid analog computing mechanism consisting of wave interference and synchronization, i.e., in the causal interaction of rhythms that lay the foundation for NW transparency (Nicolelis, 2020; p. 95).

Electromagnetic rhythms are neuron activation circuits connecting cortical and subcortical networks into a single system, creating a neural space-time continuum. Thus, an experiment conducted by Nicolelis' colleagues confirmed that after exiting a small set of neurons to form a single action potential, the entire network of neurons distributed in the cortex reaches synchronization, creating ideal rhythmic oscillations (Nicolelis, 2020; p. 138). This observation comes from two mechanisms of synchronous rhythm, which is based on the homogeneous principle of neural causality: 1) the rhythm is set by a rhythm driver, similar to how an orchestra is controlled by a conductor, where, for example, the thalamus can act as a conductor, projecting into all areas of the neocortex, or the reticular activating system (RAS), inhibiting beta rhythm in the neocortex, thereby activating NW; 2) rhythm represents the simultaneous activity of many neural networks forming interfering excitation regions (Bear, 2016; p. 231).

Magnetic brain fields provide NW transparency due to synchronicity: TMS confirms that exposure to the field created by the brain leads to the observed changes in the characteristics of NW. With the help of TMS, you can strengthen: 1) the effect of a rubber hand is an illusion consisting of deceiving the brain at the level of a body model and a model of the world when the rubber hand is interpreted by the brain as its own (Nicolelis, 2020; p. 148); 2) reduce phantom pain through desynchronization of rhythms simulating phantom experiences, which are the same for the brain as receptor ones; 3) to improve the reaction in the case of left-sided spatial ignoring, which proves the possibility of influencing NW through rhythm disturbance and, of course, confirms the fundamental importance of these (Nicolelis, 2020; p. 155). Objective matter forms neural matter (EMMNW — an empirical model of matter), and all other NW models should be considered from different levels combined due to electromagnetic activity:

Table 1. Levels of the neuronal world organisation
1. Atomic and quantum
2. Molecular
3. Genetic
4. Neurochemical
5. Subcellular
6. Cellular
7. Network
8. Cortical
9. The whole brain

This separation is helpful to demonstrate that NW is without any integrity. Each level is more detailed, in turn, because it is even more detailed. Thus, to infinity because the existence of indivisible particles is logically and experientially contradictory. Electromagnetic fields combine all these levels, modeling the self-model and the world model. Assuming that it is not possible to establish specific zones by stimulating the brain responsible for complex experiences, emotions, and other aspects of NW (Nicolelis, 2020; p. 144), it follows that they are distributed in the neural networks and become significant only as a result of synchronization, accumulates millions of neurons like a puzzle.

Electromagnetic synchronization forms a single communicative space between the networks and areas of the brain, regulating the relationship of one network to another and thus ensuring the stability of a particular aspect of HW depending on a specific bundle of neurons. If synchronization were simply a by-product of neuron activity, desynchronization would not have dropped the relevant elements of NW. Still, the reverse is true: stimulation of brain fields by the magnetic TMS coil leads to a change in the suppressed/stimulated aspect of NW, which supports their fundamental role in the creation of HW: through TMS stimulation, we can suppress any part of NW — the body model if we direct the coil to the zone S1 - S2, etc. (Nicolelis, 2020; p. 158).

Neural rhythms range from low frequency (0.01 Hz) to high frequency - up to 1000 Hz (Baars, 2010; p. 160): each rhythm contributes to maintaining NW or suppressing it. Low-frequency and high-frequency rhythms can be both low-amplitude and high-amplitude, demonstrating the intensity of neural ensembles' activity. Rhythm reflects the synchrony of neurons. Therefore, the study of neural oscillations is of great importance for describing the properties of NW since the simultaneous activation of groups of neurons provides more information about the neural world than the activity of private neurons. The uniformity of rhythms, independent of the volume of the brain, proves the unity of the neural worlds of all animals: for example, the alpha rhythm is the same in guinea pigs, macaques, hamsters, pigs, and humans. The same is true for all other rhythms. It is natural that in different animals, whose brains create NW, the rhythms are the same because otherwise, neural modeling is impossible: NW exists within stringent limits of electrical activity, therefore: 1) its existence outside these boundaries is impossible; 2) its non-existence is impossible in the presence of brain rhythms.

High levels of gamma oscillations implement sensory processing and enhance the sensory input, making the EMNW stable (Buzsáki, 2006; p. 257). A complete synchronization is unattainable in some cases. Therefore, phase coherence is observed — synchronization with a time shift: in studies of patients with epilepsy, it was found that the supply of a flash of light to the left eye causes a wide spread of synchronous gamma rhythms 300 ms after stimulation from the occipital cortex to the parietal and temporal (Doesburg, 2008). An explosive synchronization wave occurs 100 ms after stimulation. It lasts 500 ms, from which it is clear that similar abrupt bursts of neural activity are stable in the time and space of the connectome model.

Empirical and abstract models of the neuronal world (EMNW and AMNW)

The neural world is created by two basic models: the empirical NW model (EMNW) and the abstract NW model (AMNW). The first represents active gamma and beta modeling, forming a contemplative reality; the second is a less intense activation of the same brain areas mediating EMNW, realizing the abstraction of empirical content. EMNW can be conditionally called “perception,” but the brain does not contact objective reality, i.e., it is incorrect, and AMNW is imagination, which is acceptable. At the moment, it is known that EMNW is induced by the reticular activating system (RAS): when the body wakes up from sleep, RAS activates the rhythm of wakefulness in the cortex through the hypothalamus, i.e., activates NW, and when it falls asleep, the rhythm is suppressed (Bear, 2016; p. 252). The fundamental role of RAS in maintaining NW is confirmed by the fact that when the brain stem is damaged, an irreparable coma occurs (Kolb, 2019; p. 544). Accordingly, each NW model splits into an empirical and an abstract one, laying down a fundamental dichotomy, which is conditional since, in reality, the entire neural world is homogeneous. However, at a dependent level, we recognize such a dichotomy since violation of AMNW, i.e., its inclusion in the space of EMNW (GRP — global workspace), represents hallucinations. Such a failure is caused, like any failure of the neural world, by the desynchronization of electromagnetic rhythms (Nicolelis, 2020; p. 159).

Abstract model of the neuronal world (AMNW); connection with an empirical model

AMNW is imagination, i.e., the activity of the same zones that mediate EMNW. Imagining movements is a less intense activation of motor and somatosensory areas than during the campaign; imagining sounds is a less intense activity of secondary auditory regions, i.e., A2; imagining taste is similar; however, sometimes imagination, i.e., AMNW, can turn into EMSNW, as in the case of the representation of something sour, after which there is a feeling of soreness (Ganis, 2004).

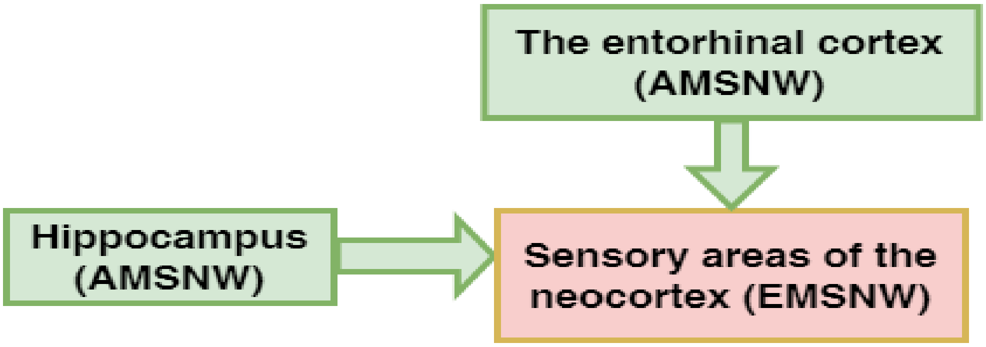

Figure 2. The connection of AMSNW with EMSNW through theta rhythm

In every brain that creates NW, there are both empirical and abstract models of NW: their exclusively correct interaction, due to electromagnetic synchronization, mediates the transparency of NW. If high—frequency rhythms set EMNW, then AMNW is set by low-frequency ones: for example, AMSNW (an abstract model of the space) in the hippocampus is mediated by a theta rhythm (Baars, 2010; p. 415). An empirical model refers to an abstract one, like a sunset to its landscape, a sketch.

The empirical model is useless without an abstract model, and vice versa: without the first, neither purposeful behavior, cognition, nor orientation in the neural space is possible because the empirical model of space is essential only when it is detailed by the neurons of the hippocampal lattice — AMSNW.

Therefore, it is evident that insects have AMNW; otherwise, their behavior would be disorganized. AMNW has both innate and formed components: demonstrating a silhouette image of a cat to kittens causes six-week-old kittens to raise their fur, show their teeth, and implement a model of permissive behavior, although up to this point, they have never seen such a pose as a silhouette (Kolb, 1975). This proves that AMNW is already formed at birth in the brains of kittens and other animals. It already contains the essential elements of the matter model (MM). Objects, social context: cat poses, sequences of sounds (meowing), and other objects. It turns out that the kittens' brain compares the stimuli of the environment with a set of innate criteria, i.e., there is a transition of information from EMNW to AMNW.

In the brain of cats, there is a neural mechanism that triggers the reaction of persecution and murder, which is based on comparing the empirical model of the victim object, i.e., EMMNW, with its abstract form in the AMNW. A mouse created by the cat's brain in response to sensory stimuli activated by them is identified through the ventral visual stream by neurons of the temporal lobe, forming AMNW as a victim, and a chase and murder reaction based on the opiate reinforcement system is triggered (Baars, 2010; p. 260). It turns out that the AMNW is a kind of set of criteria with which the brain compares empirical objects it creates. Each biological species, as a rule, reacts by launching a sexual program to an individual of its species, which also proves the innateness of sexual behavior: this also indicates that the design of the genitals is already embedded in the AMNW of organisms because their type triggers an arousal reaction, which means that the empirical model of the genitals was identified as suitable through the temporal cortex. Then, the neural network responsible for the motor program of copulation was launched. The innateness of AKMNW (kinesthetic) is also proven by blind children exhibiting the same facial expressions as adults. These children could not see the expressions on any face and imitate them. The innateness of the entire NW and the AMNW is explained by the consolidation of adaptive behaviors during natural selection: behavior is neural activity, and the DNA code determines it. Therefore, the a priori nature of NW and its models is evident.

It is clear why the species Homo s. He is cruel and aggressive: strength, aggressiveness, and skill are necessary to defeat the enemy and, therefore, successfully transfer DNA. Duels are an example of consolidating social status: the winners passed on genes. Thus, sadly, murders, wars, violence, and other affective behaviors will never be eradicated because they are adaptive. Therefore, they are inherited: they are built into the AMNW, for example, the division into “friends and “strangers.” Suppose a rat is electrocuted in a cage. In that case, it immediately attacks the innocently nearby: the rat's brain connects the cause of pain with the nearest NW object, forming a rather primitive interpretation of what happened. This is reminiscent of the situation when an X-brand car crashed into a crowd and killed eight people, and then enraged organisms smashed all the cars of this brand: the primitive mechanism of the association of NW objects controls behavior.

Self-model (SMNW)

The self-model splits into an empirical (ES-MNW) and an abstract (AS-MNW): the first represents mentalization modules that create the illusion of subjectivity right at the moment: hundreds of millions of neurons are involved in this multidimensional process; the second is the dissociated content of the self-model, representing as 1) a speech autobiographical story, i.e. AVS-MNW (abstract verbal self-model), as well as a non-verbal representation of oneself in the model of space (AMSNW) and the model of time (AMTNW), respectively dissociated from EMSNW — AMSNW, EMTNW— AMTNW, i.e. ANVS-MNW (abstract non-verbal self-model).

In turn, ES-MNW is divided into EVS-MNW (verbal) — speech story about yourself, and AS-MNW — into AVS-MNW, which is a verbal representation of the verbalized self-model, and ANS-MNW (nonverbal) — a nonverbal representation of the verbalized self-model, i.e., EVS-MNW, dissociated by the temporal lobes. In general, the self-model includes 1) the model of the subject, which splits into a) the scheme of mind (temporal-parietal section of the scheme of mind), b) the theory of mind (you-model), c) mentalization (DMN and MNS networks); 2) a body model that breaks down into abstract and empirical levels, as well as verbal and non-verbal aspects.

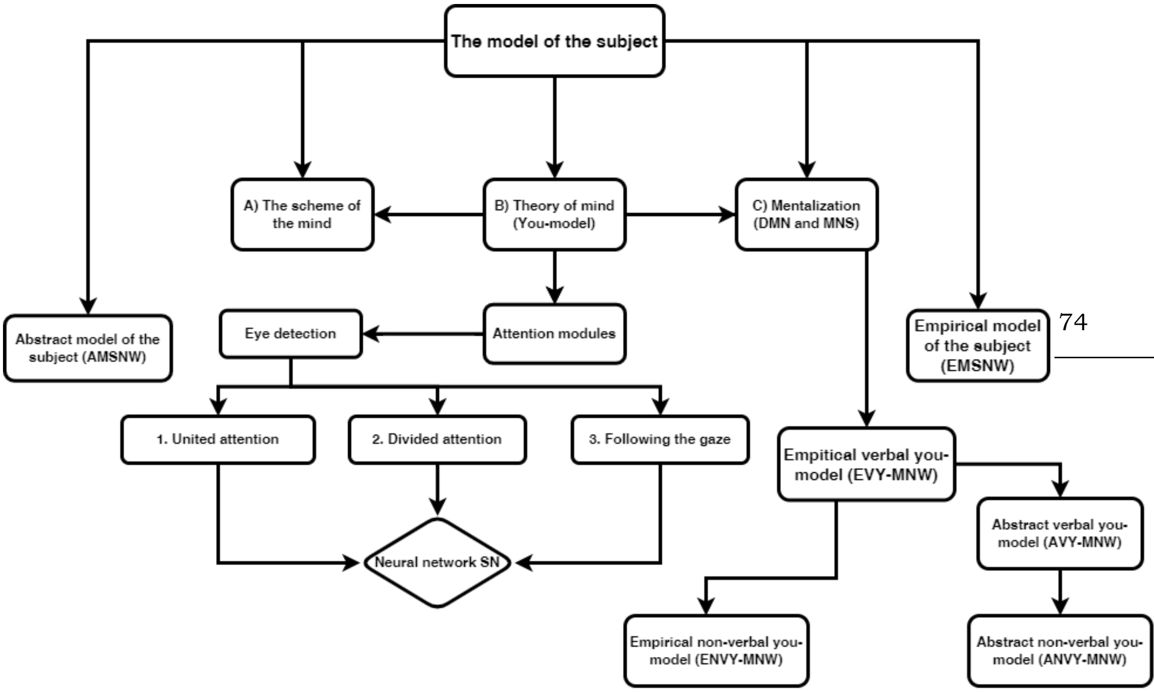

Figure 3. The model of the subject

Basic elements of the self-model and you-model

Let us consider the basic elements that add up the “I” and “you” models into an illusory unity: 1) a model of faces; 2) a model of emotions; 3) a model of experiences (theory of the “mental”); 4) a model of actions; 5) a forecasting model (assessment and reward); 6) motivation and reinforcement Model (MMaRNW).

1) Face model (EFMNW)

After a violation of the amygdala, 1) fear disappears; 2) there is an inability to recognize fear on faces, i.e., the mimic aspect of fear — the AFMNW (face model) is violated, but not the EFMNW, which fails when the vision (face recognition zone) is damaged and leads to prosopagnosia; 3) a malfunction in the EEMNW (emotions model) — such as a) fear; b) anger; c) sadness; d) disgust (Bear, 2016; p. 198).

The EMFNW (empirical model of faces) includes 1) FRZ (face recognition zone); 2) EMSNW, i.e., the entire visual system that provides the possibility of recognition networks; 3) neural synchronization/amplitude (N170), which implements face modeling (Leerisi, 2021; p. 170).

The AMFNW (abstract model of faces) includes: 1) the amygdala (AMG), which allows you to recognize emotions on faces that carry potential danger so that, if identified, you can trigger a defense reaction through 1) the ventral amygdala-fugal pathway; 2) the marginal strip that connects the amygdala to the hypothalamus.

2) The emotion model (EMNW)

It consists of the total activity: 1) fusiform gyrus (FG); 2) superior temporal sulcus (STS); 3) insular lobe (INS); 4) ventromedial PFC (vmPFC); 5) somatosensory cortex (SS); 6) amygdala (AMG). Like all NW models, the emotion model splits into empirical and abstract: the first represents the modeling of emotions within the framework of EMNW, and the second is their recognition. The basolateral nuclei of the amygdala analyze a) visual, b) auditory, c) gustatory, and d) kinesthetic models of NW, thereby forming a1) EVMENW (visual model of emotions), b1) EAMENW (auditory), b1) EGMENW (gustatory); g1) EKMENW (kinesthetic). The corticomedial nuclei of the amygdala determine the EOMENW (olfactory model of emotions); 2) fusiform gyrus (FG); 3) superior temporal sulcus (STS); 4) ventromedial PFC (vmPFC).

3) The experience model (EMNW)

Breaking down into empirical and abstract, the experience model includes 1) temporoparietal node (mind diagram; TPJ); 2) temporal pole (TP); 3) preclinium (PC); 4) anterior cingulate cortex (ACC); 5) dorsomedial PFC (dmPFC).

4) The action model (AMNW)

The action model should include 1) the superior temporal sulcus (STS); 2) the motor system (M1 – M2); 3) the parietal cortex (PL); 4) the somatosensory cortex (SS); 5) the premotor cortex (PrC); 5) the mirror neuron system (Kazanovich, 2015).

5) Forecasting model (FMNW)

EMPNW includes 1) striatum (Str); 2) nucleus accumbens (NAcc); 3) anterior cingulate cortex (ACC); 5) ventromedial PFC (vmPFC). This model represents an extension of mentalization, detailing the social interactions of animals.

6) Motivation and reinforcement model (MaRMNW)

It is characterized by the activity of 1) a dopamine reinforcement system and 2) an opiate-endocannabinoid reinforcement system. The first is responsible for interest in NW objects, while the second is responsible for inducing pleasure during the achievement of objects. When the cat's brain activates the empirical mouse model, the desired system triggers the neural networks of attention and the somatosensory body model (EBM), forcing the cat to prepare for a jump. The reinforcement system brings the predator incredible pleasure from dismembering and eating the victim. Thus, any behavior is strictly determined by the system of desire and reinforcement. Therefore, it is evident that no purposeful action on Earth has been performed without the participation of a motivation and reinforcement model. The fundamental role of the amygdala in reproductive motivation can be separately noted: its destruction (amygdalotomy) leads to the destruction of motivational behavior aimed at reproduction.

Body model (BMNW)

The body model splits into an empirical and an abstract one. EBMNW is a direct sensation of the body, the relationship of its parts to each other, representing the position in the EMSNW. ABMNW is the imagination of the body, the planning of motor acts, consisting of the subthreshold activation of neurons of the motor cortex and mediated by the mu rhythm (8-13 Hz) (Nishimura, 2018). The initiation of movement blocks the mu rhythm, i.e., ABMNW. ABMNW suppresses beta rhythm: when imagining movements, it disappears, so it is natural to assume that it is responsible for the depression of ABMNW and the activation of EBMNW. The body model should be divided into interoception — a direct sense of the “integrity” of the body and proprioception — a sense of the position of body parts to each other. It is important to note here that what organisms see as a body belongs to the model of the world since the body is the same neural object as all the others. The body model represents precisely how it feels. When we look at clothes from the outside, they are neural objects, but when we put them on, they become part of the body model because they are felt on the body. The same thing happens with any object with which we interact: for example, a car represents a neural object when we look at it, but while driving, it becomes part of a body model: we begin to feel its boundaries, the nature of movement, the ability to gain speed.

From this, it is clear that the body model is not something fixed and stable; however, it is like everything created by the brain and included in its models. In wakefulness, the body model is set; however, for example, in lucid dreams, the brain can change the body model, as well as with various disorders: metamorphopsia, Alice in Wonderland syndrome, hallucinogens, and hypoxia.

The body model consists of various modules corresponding to receptor projections: interoception breaks down into irritation — nociception; pressure — tactile sensitivity; proprioception — movement: the feeling of the position of body parts relative to each other. Interoreception is a neural model of internal organs. Nociception is a simulation of pain, temperature, and itching: it is formed by the tips of the dendrites of sensitive neurons: a) free nerve endings reacting to pain (acute, dull); b) reacting to temperature (body, cold). It is divided into somatosensory and motor. The first one represents the convergence of receptors in the cerebral cortex, i.e., it mediates the state of body parts both "external" and "internal." The second is the activation of motor behavior.

Tactile sensitivity forms a kinesthetic model of space (EKMSNW) — a sense of touch: mechanical pressure on the receptor capsules mediates dendrites' excitation, including action potentials. A corresponding receptor is responsible for each aspect of the kinesthetic model of space: 1) Meissner corpuscles — touch; 2) Pacini corpuscles — vibration; 3) Ruffini corpuscles — stretching of the skin; 4) Merkel cells — feeling the structure of the surface; 5) receptors of hair follicles — vibration and stretching of the skin.

Proprioception complements the kinesthetic space model, forming an empirical representation of body parts' position in the general space model. It is modeled as 1) neuromuscular spindle — stretching of muscles; 2) Golgi tendon apparatus — stretching of tendons; 3) articular receptors — the movement of joints. Proprioception also includes the vestibular system, which forms a neural model of speed — acceleration, and deceleration of movements- a position model in a gravitational field. The vestibular system compensates for destabilizing movements, due to which the neural model of space and proprioception remain transparent: for example, if you shake your head while looking at an object in front of you, it will stay in focus, but if you shake the object, it will lose focus: in the first case, the focus is determined by the vestibular system. The onset of stimuli is indicated by rapidly adapting receptors (Pacini and Meissner corpuscles) and, throughout the exposure to AP (action potential), slowly activating receptors (Ruffini corpuscles, Merkel cells, hair follicle receptors) support.

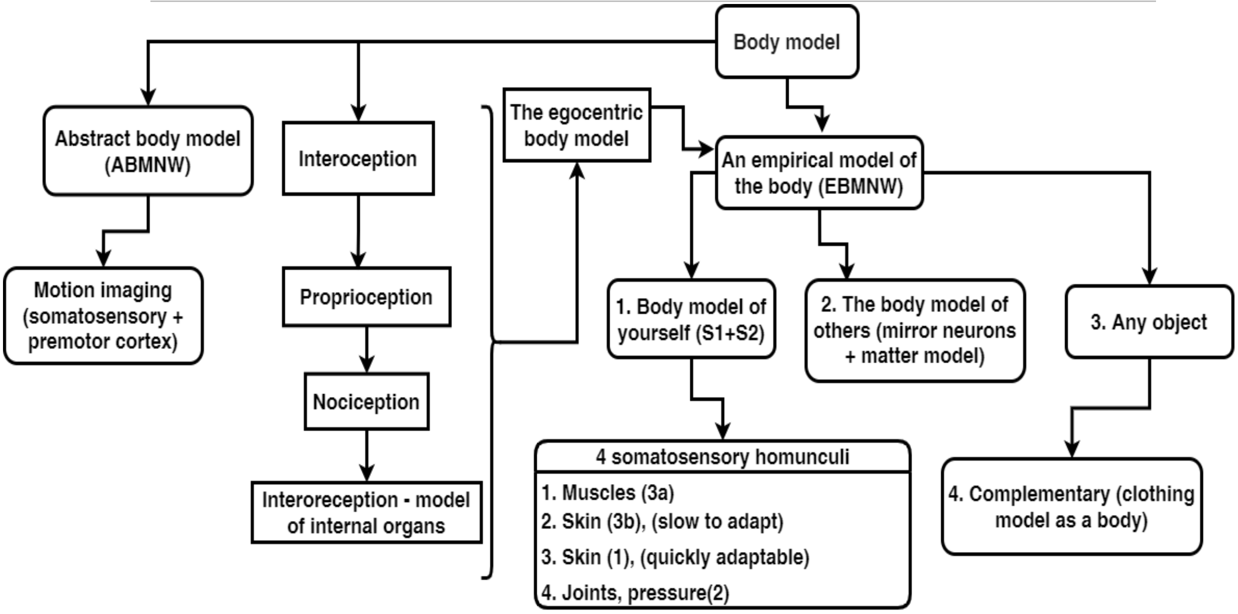

Figure 4. Body model

The world model (WMNW)

The world model is an illusion of the "outside world" created by an extensive network of neurons in the parietal and occipital lobes, on which a body model (EBM) created by the brain's somatosensory cortex is superimposed. There is no contact between the body model and the world model — these are differentiated processes that develop into an appearance of integrity during the synchronization of the NW tunnel. The model of the subject does not affect the model of the world in the same way: it turns out that there is a model of the world, but nothing that affects it. It is necessary to understand that no fixed and unchanging group of neurons mediates both the model of the world and the self-model. At each moment, neurons are in a state of dynamic change but never stability. In this context, emphasizing the world model's instability caused by the connection and disconnection of neural ensembles to the global workspace is worth emphasizing. 78

The world model consists of the following neural models:

Table 2. The world model
1. The space model
2. The time model
3. The causality model
4. The model of matter

The space model (SMNW)

The abstract model of space is created by hippocampal neurons — place cells; lattice cells — neurons of the entorhinal cortex: they form an "empty" model of the space, its structure and shape, and sensory modalities are superimposed on these "blanks." This model is correctly called abstract because it models the structure of space without filling it with content. Hence, it is clear that the hippocampal complex is responsible for modeling the abstract model of space (AMSNW). The ability to orient and construct new topographic maps is tied to this part of the brain: when it is deleted, memorization, recall, and encoding of space are disrupted.

There is no doubt that these cells are primarily myelinated during the sensitive period. Without their activity, sensory data is useless because they relate to the neurons of space in the same way as the contents of a topographic map relate to its coloring. Therefore, if we cut off all sensory modalities, i.e., make an Earthling blind or deaf, he can still navigate in space since the abstract model has not been affected. On the contrary, if you remove all the neurons of space but leave all sensory modalities, no matter what an Earthling does, he will not be able to navigate in space and realize the position of the body model relative to NW objects.

Table 3. Neurons of an abstract model of space
1. Neurons of the place
2. Grid neurons
3. Neurons of the head direction
4. Neurons of the border
5. Neurons of speed
6. Neurons of spatial time
7. Spatial neurons of the visual field
8. Neurons combining the signs of cells of the place and direction of the head

The empirical model of space (EMNW) consists of sensory modalities. Suppose AMSNW represents the neurons of the hippocampus and entorhinal cortex, which form the brain's ability to navigate by identifying its position (neurons of place) within the grid of grid neurons (Kazanovich, 2015). In that case, EMSNW is primarily a multisensory model that is superimposed on the neurons of space during neural synchronization. EMPNW also supports one of the aspects of the illusion of subjectivity, namely, the first-person view, which is partly detailed by neurons of the direction of the head and partly by neurons of the visual field.

The time model (TMNW)

The time experienced by organisms is neural networks that model duration: their change according to the principle of causality is called time. Moreover, what are neural networks? These are chemical processes; sequential changes subordinated to causality. Therefore, time is a pure change, i.e., causality (Schopenhauer, 2010). Here, it is essential to draw a line between objective time, i.e., pure causality, and neuronal time, which splits into empirical and abstract models, i.e., for duration modeling (EMTNW) and time retrospective (AMTNW), respectively. In this case, it is argued that the sense of time is not time itself but brain predictive calculations, which are easy to disrupt with the help of, for example, serotonin receptor agonists — psilocybin and LSD (Carhart-Harris, 2016) (Nicolelis, 2020; p. 335). The AMTNW maintains an illusory sense of the unity of the past, present, and future, and the EMTNW is responsible for experiencing duration.

So, the time model is a neural process that can be manipulated. However, time itself is what creates the neural world, i.e., the objective function of successive changes — causality. The primary task is to separate what is wrongly connected: the time model and objective time. Objective time is simply sequential changes, which, among other things, create an empirical model of time: sequential changes in the corresponding neurons' modeling duration are causal processes, i.e., time. These sequential changes have no speed but only quality — which receptor the neurotransmitter interacts with, etc.

The empirical model of time has speed: by influencing the necessary neurotransmitters, it is easy to cause various violations of the empirical model of time: acceleration, deceleration, stop (moments of eternity), disappearance, a feeling of eternity, etc. All these sensations are mediated by objective time, i.e., causality observed in the brain.

By separating the time and objective time models, we connect and identify objective time and causality — causality is time. The word "time" denotes both an empirical model of time and an abstract one, but they are not time. Time is precisely what creates these models — objective changes in the brain. However, any causal changes are time. Thus, time is a property of matter, its pure change and action. Time is a consistent change in objective matter. No separate and independent process creates or is duration.

Within the framework of the neural world, which is a consequence of objective reality, time is a neural model: abstract and empirical, which creates, in the first case, a retrospection and a prospectus, i.e., a model of the past and the future, and in the second — a direct sense of time. Objective time is a sequential change that, in particular, creates the neural world and, accordingly, the time model. It turns out that objective time is pure causality, a sequence of events conditioned by the relationship "basis — consequence."

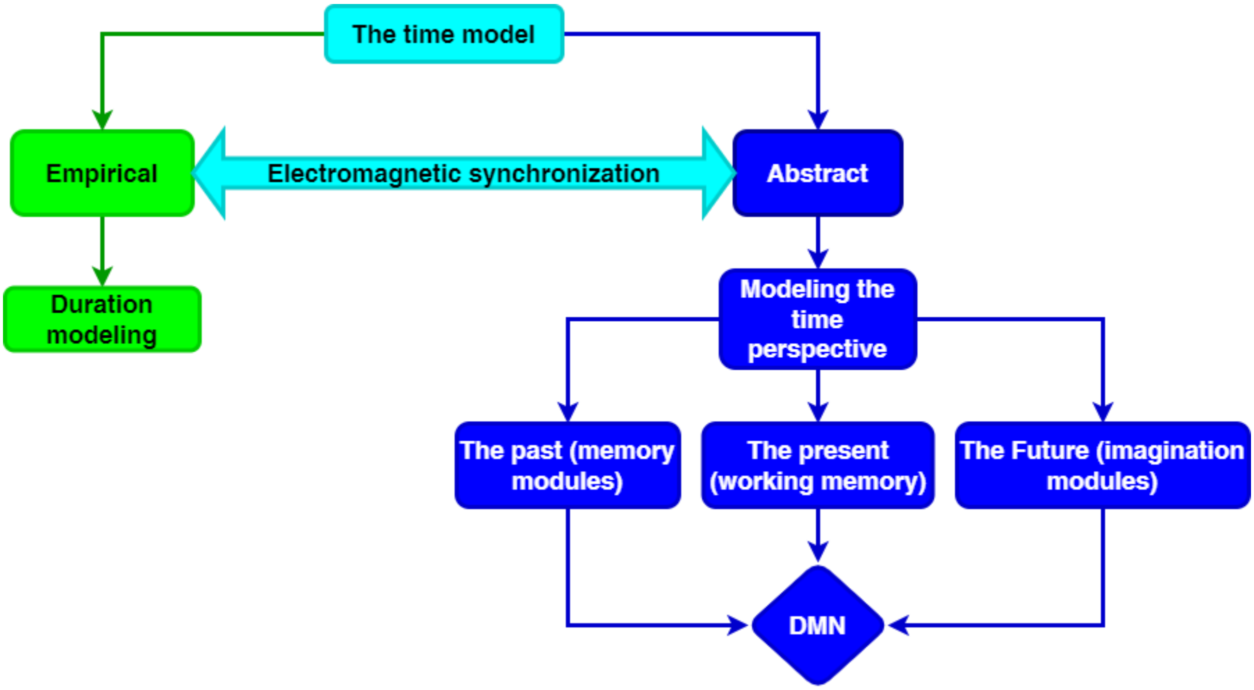

Figure 5. The time model

The causality model (CMNW)

What is the nature of causation — neuronal or objective? There is no doubt that causality is objective because, otherwise, NW had no basis, and such a thing is impossible. However, the changes that each organism observes are neuronal; therefore, it should be recognized that causality is both objective and neuronal. The causality model repeats objective causality, but only in cases where the mediating modules work correctly: 1) a left-hemisphere speech interpreter and 2) a right-hemisphere anomaly detection module. In the case of a malfunction in the right hemisphere, the anomaly detection module leads to apophenia, i.e., a state of hyperconnection of neural traces. In the case of a violation of the speech interpreter, on the contrary, causality ceases to be modeled at all. In other words, objective causality creates a virtual model of causality just as it creates any other aspect of the neural world.

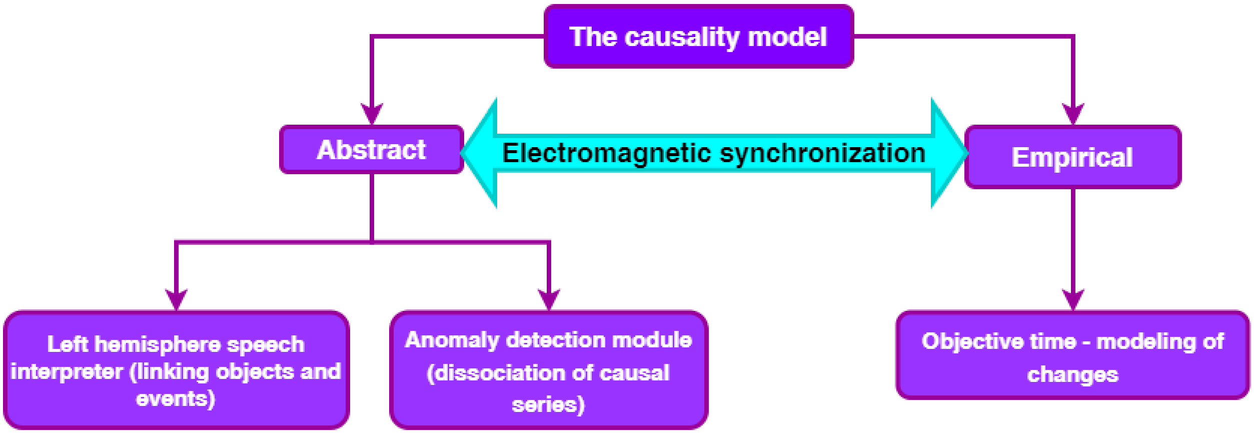

Figure 6. The causality model

There are two kinds of causality: 1) illusory, created by the left-hemisphere speech interpreter; 2) objective, according to which, in particular, the left-hemisphere interpreter works. Objective causality is an inevitable consequence mediated by the basis of its occurrence: the neural world is constructed according to physicochemical causality with the same necessity as gas is released if a weak acid is formed in the reaction, decomposed into oxide and water. In a narrow sense, the causality model is a speech interpreter and anomaly detector. In a broad sense, any synaptic binding of NW objects into causal series and pairs, i.e., the process of synchronizing the connectome. Causality at the central nervous system level is synaptic convergence, which is the sequential conduction of impulses during neurotransmitter communication. However, CM is a particular manifestation of this extensive—scale brain process aimed at increasing the effectiveness of cognition.

The model of matter (MMNW)

The objects with which organisms interact are predictive multi-level brain calculations. Like a brain, a computer can create virtual worlds with virtual objects, where each object is a code. There is nothing special about creating neural models of matter: even the most straightforward nervous system continuously makes neural matter. Matter should be called a simplified model of the objective Universe; however, the model of matter does not copy the Universe but objectifies it.

The model of matter consists of a model of space and a model of time: it is a compression of space and time, their direct action. It can be argued that neural matter is identical to objective matter, which creates NW. Visual and kinesthetic hallucinations are a failure of the matter module, more precisely, a violation of the centers of wakefulness, resulting from which the abstract model of matter seeps into the level of empirical matter. The model of matter, like the whole NW, is necessary for survival because if the brain does not model the model of matter, then it has nothing to interact with: in this regard, let us recall the basic principle of the functioning of the nervous system: the brain generates movement in response to the created model of the environment (Kolb, 2019; p. 89). Thus, a model of matter is necessary to generate motion, the ultimate goal of which is DNA reproduction.

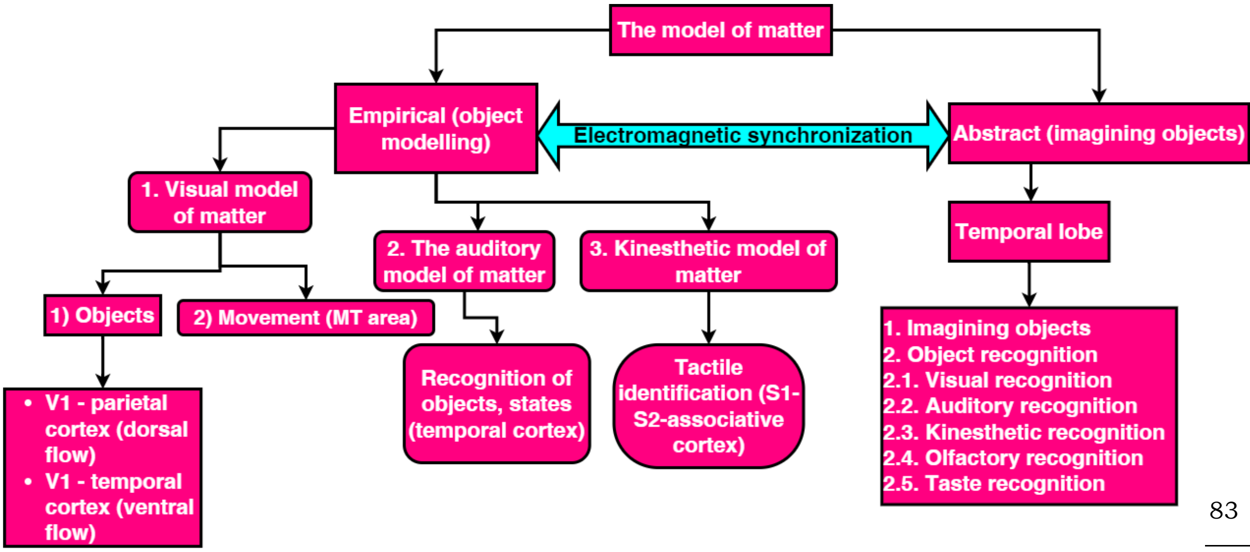

Figure 7. The model of matter

Just as the entire NW is divided into abstract and empirical models, so is the model of matter; moreover, this division is preserved within each sensory modality. The center of the abstract model of matter is located in the temporal lobe since it is within its framework that the identification of stimuli takes place — recognition, i.e., the relationship of an empirical object created by the brain with an abstract model of this object and its linguistic characteristics. The ventral flow modeling matter passes precisely through the temporal lobe. Therefore, it is clear that here, among other things, the abstraction of NW objects takes place (Kolb, 2019; p. 356). The sound produced by the object follows the ventral flow from the auditory system to the temporal lobe, where the ratio of sound and the abstract model of the object occurs.

Matter is both objective and neuronal: the first creates the second. The brain is a material object that models neural matter (NMNW) — the basis of NW and its dissociation — ANMNW. The nature of neural matter lies in action—sequential neural calculations, i.e., causality. Thus, neural networks that create neural objects represent causality in their purest form: physical changes (electrical impulses, electromagnetic synchronization) and chemical (release of neurotransmitters into the synaptic cleft, activity of neurohormones). Matter is objectified in form, so the space model (EMSNW) is a form of matter. It turns out that a model of matter does not exist without a model of space, but not vice versa.

The matter model is mediated by both ventral (object properties) and dorsal (object manipulation — EKMMNW) flows and associative zones (temporal lobe — AMMNW). The frontal lobe integrates information from the associative temporal and parietal lobes. It follows that 1) dorsolateral PFC, 2) orbitofrontal cortex, and 3) ventromedial PFC, receiving inputs from the temporal and parietal lobes, form an abstract model of matter. It turns out that the model of matter is formed by associative zones receiving inputs from primary sensory areas. Damage to the associative regions of the temporal cortex leads to a loss of the ability to recognize objects (agnosia). Therefore, it is clear that the AMNW develops in this area.

At the same time, the empirical model of matter represents sensory models of objects — visual, kinesthetic, auditory, gustatory, and olfactory, and those neural networks that determine the corresponding sensory modality are responsible for their synthesis. Thus, the model of matter is closely related to the model of space and time. Therefore, it is correct to point to their unity rather than differentiation since modeling MM is inextricably linked with the processes of space-time synthesis. To some extent, these processes are the same.

Visual objects, i.e., the visual model of matter (EVMMNW), are finally formed in the lower temporal zone of the ventral flow TE, and the inclusion of the parietal lobe PG is necessary for the localization of MM objects within the body model (EBM) for stretching hands and manipulating objects. The lateral occipital complex (LOC) makes a significant contribution to MM since it has been demonstrated (Malack, 1995) that it is enormously excited in response to various shapes of objects. When presenting more and more permanent images, V1 activity (primary synthesis) increases and LOC decreases, then demonstrating a complete picture induces LOC activity: it follows that LOC performs primary MM processing, and the TE zone — the final one. Different LOC neurons mediate dissimilar types of objects: the object's position does not affect its activity.

The modalities of the matter model

The matter model, like the rest of the NW models, should be divided into modalities: 1) visual, 2) auditory, 3) kinesthetic, 4) olfactory, and 5) gustatory. In addition to sensory modalities, it is necessary to highlight: 1) dorsal flow (at all levels); 2) ventral flow; 3) facial recognition zone (ZRL); 4) lateral occipital complex (LOC); 5) parahippocampal area of space (PAS).

1. Visual: The broad medial temporal cortex (MTC) system combines sensory modalities, laying the foundation of the AVMMNW. The inferior temporal cortex models visual objects, i.e., it partially determines the computer. In turn, the hippocampus consolidates new objects and associations, investing in creating an AMNW determined by theta rhythms.

2. Auditory: EMMNW is the recognition of objects in the temporal cortex, and AMMNW is the preservation of auditory memory of significant objects by the ventral and posterior regions of the PFC (Ranganath, D'Esposito, 2005).

3. Kinesthetic: EKMMNW models kinesthetic objects and their properties, hardness, roughness, softness, and others, using the somatosensory cortex (S1-S2). AKMMNW is the recognition of kinesthetic models based on projections of the somatosensory cortex into the temporal cortex.

4. Olfactory: EOMMNW is the construction of odors of objects and their qualities. AOMMNW is the recognition of odors and their association with significant states of the NW tunnel: the vulture brain has a detailed AOMMNW associated with the neurons of the hippocampus of the AMSNW.

5. Taste: ETMMNW is the creation of tastes by the neurons of the insular lobe. ATMMNW — taste recognition and association, for example, with AMSNW, as in the case of catfish.

The tunnel of the neuronal world

The neural world is a dynamic process of neural modeling of the virtual model of the world and the self-model; however, this process is devoid of a substantial basis in the sense that there is neither an actual subject nor a true object, but there is a process that is correctly called a tunnel for the reason that each previous state of the connectome determines and predetermines the subsequent state according to the principle neural causality, just as the movement of an object in a tunnel is determined by its previous position in space. Thus, the brain creates an NW tunnel, which is evolutionarily formed in each species, with specific quantitative differences depending on the number and distribution of neurons in the brain but qualitative uniformity.

It is necessary to highlight the predominant aspect of the NW tunnel depending on the biological species: in underground species, EKMSNW, EAMSNW, and EGMSNW prevail; in aquatic species, EAMSNW (echolocation), and in terrestrial species, EAMSNW. Therefore, the tunnel should be called either kinesthetic, auditory, etc. Nevertheless, it is evident that there is no tunnel based on a single sensory modality, but it is clear that every tunnel is multisensory. Therefore, its predominant aspect stands out in such a classification. Thus, the mole has a tactile-olfactory NW tunnel, and the hawk has a visual one. You can also build a hierarchy of sensory modalities for each NW tunnel: 1) kinesthetic aspect; 2) olfactory; 3) auditory;4) gustatory; 5) visual for the mole; 1) visual; 2) auditory; 3) kinesthetic; 4) olfactory; 5) gustatory for the hawk: and so for each kind of. Hence, it can be assumed that in a mole, the most myelinated neurons will be those responsible for the kinesthetic aspect of the tunnel and the least — those for the visual one. By this, the DNA of the mole contains a code leading to increased myelination of kinesthetic neurons compared with other sensory modalities. As already mentioned, the NW tunnel of each species has a specification depending on the prevalence of sensory modality. For example, the tunnel will be predominantly auditory in animals whose brain creates a mainly auditory model of space (EAMSNW) through echolocation. Similarly, moles and naked mole rats will have a kinesthetic NW tunnel, which is necessary for the brain to form a detailed kinesthetic model of the space of underground passages (AKMSNW). The visual aspect of the tunnel is maximally weakened due to the lack of a visual space model (EVMSNW), which is so necessary for many terrestrial species. The NW tunnel of a monkey and a rat differ significantly: the visual and auditory aspects prevail in the former, which is due to the need for accurate orientation in the neural space (EVMSNW), whereas in the latter, it is kinesthetic, which is set by the organs of touch on the rat's muzzle — sensitive antennae (Bear, 2016; p. 42). The variety of NW tunnels includes all biological species, including insects, because their brains contain the same neurons that can be found in the brain of any animal, which means that the difference between the neural worlds is not qualitative but purely quantitative, consisting in the features of the cytoarchitectonics of the connectome: this is also evident from the fact that the same neurotransmitters operate in the brains of all Earthlings. This observation indicates that the neural world is enclosed in a very rigid physiological framework: it can only exist in them, confirmed by chemical or physical effects on the brain that easily disrupt NW. It should be noted that the activation of EMNW, i.e., the NW tunnel, is mediated by primary sensory areas. AMNW is mediated by imagination, later stages of processing, which is supported by the fact that A1, i.e., the zone of immediate sensory processing, is not activated when imagining sounds, but secondary auditory areas are involved.

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