

Information, Info-Creational Field, Creativity and Creation, According to the Informational Model of Consciousness

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Abstract: With the aim to clearly distinguish between similar informational concepts related with the human organism, the specific characteristics of the concept of information, info-creational field, creativity and creation from the perspective of the informational model of consciousness are discussed, revealing the relation with the informational activity of the mind, and with the biological creation. The close relation between memory and the center of the decision and commands, with emotional participation is highlighted, supported by the thought activity, defined as the informational operator on the info-creational field of data stored in memory, which searches and transports the necessary information for analysis, judgement and decision, storing it back this time as a new informational set in memory. In the context of the informational model of consciousness, the informational processes for carriage/transfer of information in the human organisms for brain-body inter-connection and biological creation of a new living organism are discussed in terms of information, revealing specific mechanisms of interaction of information with the human brain and body, by the participation of electrical, chemical agents and structuration/destructuration processes for integration/release of information.

Keywords: Information; Informational system of the human body; Info-creational field; Creativity; Informational mechanisms; Biological creation

Introduction

The informational model of the human body recently elaborated [1], introduces the concepts of information to describe either the mental properties and microstructural modifications involved in the transport or storing of information in the human body. As the introduced terms express various informational processes and mechanisms, or invoke a fine range of informational concepts, appears to be useful to clarify both the informational support related with the intimate transport in the body and the concepts of information at the level of mind operability. An important step in this relation was already reported recently, showing that actually the material informational agents and the informational mechanisms in the human body support the mind operability [2], like the material electronic devices and associated electronic carriers support the related information in the digital info-receptors [3]. The difference is however high, because the electronic devices are not living systems [4-6]. Therefore, in such an analysis we try to take into account a fine and specific tuning of

informational terms, according with the specific circumstances and properties, distinguishing between these two systems, but resorting to comparison, when such a comparison is possible.

Specifically, the aim of this paper is to analyze the informational concepts involved in the operational processes in the human mind/body complex, and distinguish between information as mental processing, info-creational field and creativity, and matter-related information and biological creation.

Information, Informational Structure of the Human Organism, Info-Creational Field and Creativity

In Figure 1 left side is shown a schematic representation of the human brain with the main relevant zones of interest, which support distinct functions of the corresponding informational system of the human body, represented in the right side of the Figure 1.

Specifically, CASI (the center of acquisition and storing of information) is defined as a sum of the brain areas involved in the connection with reality – both from internal and external informational sources – and in the storing of the acquired information in memory, supported basically by prefrontal cortex (short-time memory) and hippocampus (long-time memory). CDC is the center of decision and command, supported by the operational areas of the brain, basically the cortex/prefrontal cortex, managing the judgment and decision making operations, expressed by attitude – the informational output response of the organism to the received information, connected to the vocal system. IES is the Info-Emotional System of the human body, connected in the brain with limbic system and in the body specifically with the heart sensitive zone of the body, which regulates the blood distribution, according to the long-term and momentary requirements. MIS is the metabolic maintenance informational system, connected in the brain with the inferior structures – brain stem/cerebellum/spinal cord and with the digestive system, responsible for metabolic processes. GTS (genetic transmission system) and IGG (info-genetic generator), connected in the brain with hypophysis and in the body with the reproduction apparatus, the info-genetic output and input respectively. IC is the Info-Connection pole of the organism, responsible during the current operations with the selection (GOOD/BAD)/(acceptance/rejection) of the received information, according to the inherited (survival) and acquired criteria. The specific activities of the informational system of the human body are reflected in consciousness as cognition-sentence centers, expressed schematically by the projection: (CASI, CDC, IES, MIS, GTS, IGG, IC) => (Ik – Iknow, Iw – Iwant, Il – Ilove, Ia – Iam, Ic – Icreate, Icd – Icreated, Ib – Ibelieve).

Within the frame of the informational system of the human body (Figure 1 right side), we have to distinguish basically between two types of information: the mental information, referring to concepts resulted from the interaction with reality, and mater-related information, which actually support the informational stream of informational carrier agents. The informational processor of mind – CDC, operates the received information. The informational operator of mind is the thought, which gets/collects the necessary information from CASI and deposits the new information achieved from the operational processes in CASI too. The decision is transmitted as corresponding motor reaction commands to the execution elements, which are the muscles. The information collected from the interaction with reality is accumulated in CASI, specifically in hippocampus for long term period, where some specific mechanisms like the plasticity of the inter-cell synapses and the epigenetic mechanisms play an essential role in learning and storage of the information [7]. Such an accumulation process refers also to the remembrances of the affective events, because the hippocampus is also part of the limbic system, responsible for the management of the emotions. The operability of CDC is therefore closely related with CASI and IES in a continuous process during the judgement. This is actually an analytic process, based on one hand on the accumulation of information as a source, and on the other hand on the decision criteria, allowing the processing of information by the acceptance/rejection YES/NO informational algorithms. At this level, CDC works with virtual/theoretical concepts, which are the information concerning the signification attributed to various things and phenomena of reality. These concepts are expressed by words in the common language, and by symbols, like in mathematics, physics and engineering [8]. This represent therefore information as significance.

CDC works therefore with information as significance, attributed to the objects, events and phenomena acquired during the exploration of reality, expressed by language and language words. The multitude of words, a high quantity of information specific for each language, accumulated in dictionaries from the life experience of human generations, are the tool of communication with self and surrounding

reality. This is information as communication, involving at least two partners – an emission source and a receptor of the transmitted message, similarly with the communication process by means of electronic transmission/reception devices, which the information theory was for the first time addressed to [8]. The accuracy of the transmitted message and of the reception depends of the “codification”/“decoding” abilities of the two partners, taking into account their personal communication skill. By codification and decoding we have to understand respectively the degree of explicit expression of the emitter, and the capabilities/preparation/interpretation level which the receiver grants to the message meaning.

The information as meaning/significance in languages is a beautiful accumulation acquired by human/humanity since immemorial times, during the interaction of the human mind with the surrounding reality. This data collection is permanently developed, boosted by the advances in the scientific/technique/communication endeavor to describe/understand the surrounding reality, at the frontier between known and unknown domain, between certainty and uncertainty. The exploration of reality brings into the knowledge field new terms and concepts, able to find/acquire a better and finer description of reality.

Information is stored on the material support of the hippocampus in CASI, which forms the life experience. When we discuss about information from this point of view, doesn't matter what kind of intimate processes are involved in the storing of information on the biological “hard” system – hippocampus. Such a manner would translate the scope of the discussion on the biological domain. Maintaining therefore the focus on the informational processing in mind, we can define an info-creational field of consciousness, as a sum of the data stored in memory, independently on how they are distributed in CASI. This definition is justified as follows: if we assign to each information a point on a plan surface, representing an address where the though should search a certain information, this would be identified by a vector with two coordinates. The huge quantity of data in memory could be represented as an information field of data, correspondingly “written” actually on a brain area where these data are distributed, like in our computer “hardware” devices. To find an information in this info-creational field, the though should act as a vector on this area, according to the address coordinates. The distribution of data is therefore important when we discuss about the activity of the thought, as informational operator, which needs an address to search and find a certain information. This search is achieved basically by means of an associative process, consisting in the recognition of another more stable/consolidated information, closely related to the actual searched information, which are to be recalled from memory.

What we are interested now, is to highlight that the mind is an operational processor (CDC \leftrightarrow CASI), creating information. The new data obtained by an operational processing is stored in CASI, as a new sort of informational ensemble, with a new meaning, associated to the objective and the result of the judgement. This is an individual process using the CDC/CASI operational tool, by which the individual life experience is enriched with new pathways of judgement and final conclusions, adding to the personal criteria new information, if this is validated by reality and become important for the individual. The mental creativity is therefore a concept characteristic to the operability in a certain way of the CASI-IES/CDC systems, able to find/feel/discover by a cognitive-sentient exploration of reality and own accumulated experience, new organized/coherent set of data, to generate a creation product/result in a conceptive/informational sense. This is built, processed and configured in mind by means of the mental “meaning-language” translation-dictionary, working with words – as informational common units, with symbols in mathematics and physics, with specific concepts in arts (colors, forms, sounds), in design (engineering, fashion), or in other domains of activity,



according to own education and professional preparation. IES provides a contributing component from CASI, as a response to information and felt as emotional vibration of the hearth and body. In common terms, the creativity is defined as a decisional making process, with the contribution of knowledge, intellectual skills (personal intelligence) and thinking style [9], which corresponds with the present description, which is discussed this time in terms of related information and brain-body specific informational activity and neuro-connection. The operability of mental creativity is suggestively indicated in Figure 1

right side in a pink color, engaging the centers of perception/selection (CASI/Ik)/(IC/Ib), closely collaborating with CDC/Iw, with the contribution of IES/Il, the “echo” of informational perception either from external or internal reality. The impulses/signals coming from the center (MIS/Ia)/(GTS/Ic)/(IGGIcd) are also indicated in the right side of Figure 1, as possible contributing components to the judgement operated by CDC/Iw. This is information as a result of mental operations/operability.

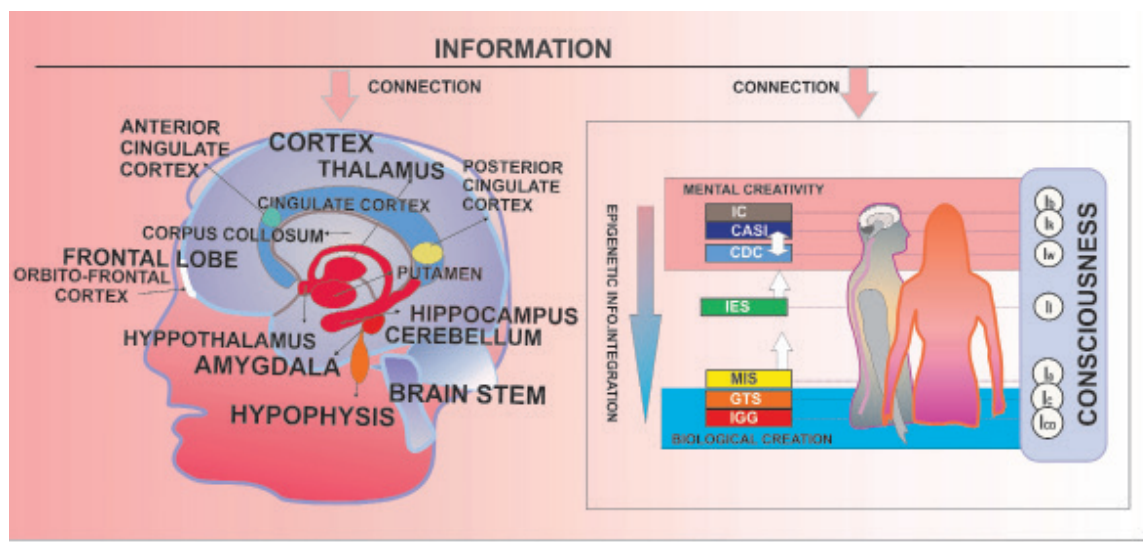


Figure 1: Schematic representation of the engaged brain areas in informational activities (left side), according to the informational model of consciousness, showing the components of the informational system of the human body and the corresponding cognitive-sentient centers (right side).

Imagination is a component of creativity, a process of construction of new informational “assemblies” from the existent or imaginary data, either virtual/fictive images, sounds, words, symbols, or any other mind “objects”/events, “mounted” in a close way from elementary components. Fantasy is a mental process, free to gather and link together various informational pieces, in a coherent/ intelligible but unreal way, in a unique whole. In mathematics and physics, the logic is the main tool for creation, in artistic field some other specific tools are used – language, forms, colors, gestic, postures, sounds. The creativity is the mental force which has been determining all the extraordinary technological advances which we enjoy nowadays. Creativity is the force which initiated and developed the high technological advances in our informational era of info-digital devices, which already became indispensable every day in our life. The “day-dreaming” is an interruptive/disruptive process from the connection with reality, commonly experienced, managed by the posterior cingulate cortex, as it was recently demonstrated [10]. Such a process deviates the mind into an introversion state, connecting it to the personal projects, dreams and free fantasy, helping the creativity and creation [11].

However, the fantasy and imagination can create also an unreal world in the predisposed minds, which end up confusing the real life with fantasy. Such categories enter already in an abnormal domain, that of people with dysfunctions of the nervous system, although they are not always recognized and/or diagnosed as such [12]. Another category of people creates fantasist scenarios, in order to hide the life reality and to present a different, distorted face of reality, ending up to belief themselves their own fantasy creation, which becomes their parallel reality. Drug addiction is a way to voluntarily induce a world of fantasies, far from the reality, which ruin the normal trajectory of life and healthy. Dramatic events, especially during the childhood or youngness, when the nervous system is still not sufficiently matured, can change definitively the life, creating decision criteria which promote a distortional view of life, with negative consequences for own life and that of the persons around, manifested by depression, anxiety

or bipolar disorder. Schizophrenia is an advanced form of the rupture from reality, manifested by imagination of various phantasmagoric events (images, sounds, imaginary scenes and scenarios) lived with intensity in a parallel unreal world.

Therefore, we have to distinguish between these forms of dysfunctionality-induced imagination from the real process of creativity, oriented to fulfill a certain well-defined objective, with productive results in own life and/or in the social environment. From informational point of view, the creativity is therefore a mental process which generates information, either expressed or not, as a new and distinct form with respect to the initial data base. The creativity is manifested as discoveries/findings in science, works/operas in arts, new products in design and manufacture sectors, new procedures, tactics, methods in sportive performance, technology, health, and/or solutions of the problems in any kind of activity, including the daily personal existence.

Carriage Mechanisms of Matter-Related Information in the Body and Biological Creation

In the microelectronic devices the information is carried out by electronic currents. A functional device is practically prepared from various small smart chips for processing of information signals, with various specific functions. In these micro-modular components, the input signal is processed to obtain another functional signal in the output terminal, which is connected with the input of the subsequent component, for a suitable info-processing. The input information could be provided by sensors, which transduce various forms of physical information (light, sound in media communication) in electrical impulses. At the other terminal of an operational device, it could be found a mechanical execution element, connected with an adequate transducer of the electrical signal.

In the human body, various types of micro-devices act to transfer information, but the mechanisms of the informational transport

are more complex, including not only electrical, but also chemical transport of material micro-components, as informational agents. For instance, the nervous cell is electrically polarized in a resting state, like a microelectronic device in a stand-by state is polarized by an electric source, before the application of a util signal. In the nervous system, the semitransparent membrane of the cell is naturally polarized with a resting electrical potential on the inside interface, because on this surface the concentration of the K^+ atoms is much higher than the concentration of the Na^+ atoms near the external surface. This is achieved by a “pumping” process of K^+/Na^+ ions against their concentration gradient, due to the high difference between the permeability of the specific corresponding receptors of the cell membrane. This process is powered by the adenosine triphosphate (ATP) molecule as energetic source of the cell, produced in mitochondria. The spontaneous shift from a resting to a depolarization state, provokes the “fire” of neuron, consisting in the shifting of a nerve electric impulse, due to the sudden movement of a Na^+ flux across the membrane through the opened Na^+ conduction channels. This means that an event – a physical stimulus, such as touch, taste, sound, light, which acts on a sensory cell receptor specifically designed, determines the energy of the stimulus (e.g., mechanical, chemical, light) to be transduced/transformed into an electrical response, causing finally the resting potential to decrease from its initial value of about -70 mV (mV = millivolt), toward a smaller values. This process takes place by the sudden opening of the Na^+ channels and the diffusion of the Na^+ ions from the external to the internal surface of the bilayer structure of the cell membrane. When the depolarization reaches about -55 mV, a neuron will fire an action potential, always the same for any neuron, determining the flowing of a positive charge pulse for about few milliseconds through the cytoplasm, which activates the opening of the sodium channels along the entire length of the nerve cell. This critical value is the threshold of fire, determining a “ALL OR NOTHING” (YES/NO) SWITCHING PROCESS, like in the switching/commutation transistors in our computers, which works in a binary YES/NO Bit-units system.

When the potassium channels are opened, the membrane commutates into the initial polarization resting state. Because the amplitude of the nerve impulses are practically the same, the important in the information processing in the nervous system are rather the number and frequency of the impulses. A new YES/NO step occurs by the competition between the excitatory and inhibitory neurotransmitters expelled to the neighbor nervous cell by Ca^{2+} conduction channels in the synaptic gap, which determines (YES), or not (NO), the fire of the subsequent neighbor nervous cell.

Neurotransmitters are the informational chemical messengers in the brain and nervous system, that transduce the electrical information induced by the action potential in the cell axon into chemical info-agents, which across the inter-nervous gap from the presynaptic to postsynaptic cell. Most of neurotransmitters are synthesized in the cell cytoplasm in the nerve terminal and deposited in cell vesicles. Various types of molecules could play the role of neurotransmitters, from atypical NO and CO gas, to much more complex structures, but only 12 neurotransmitters among more than 100 neuroactive peptides has been identified [13]. Neurotransmitters send instructions from a brain cell to the next cell and to the subsequent chain throughout the brain and body. When the electric command is completed, the neurotransmitters float away, or are absorbed back up by the synaptic vesicles they came from. These chemical agents carry specific information, and induce in consciousness various specific mood sensations and impulses, either of arousal (epinephrine and norepinephrine) or inhibition (serotonina and gamma-aminobutyric acid (GABA)) [12]. The hormones are long range informational agents, communicating with the body by means of the blood circulation system. A short range informational communication is achieved by the direct contact between the neighboring cells.

Seven neurotransmitters are essential as informational agents of the brain for the normal functionality of the body, i.e. glutamate, GABA (γ -aminobutyric acid), dopamine, adrenaline (epinephrine), serotonin, oxytocin, acetylcholine, which intervene/regulate various activities of the body: heart rate, breathing, sleep cycles, digestion, appetite (MIS/Ia), mood states (IES/II), concentration (CDC/Iw)/(CASI/Ik), muscle movement (execution elements). Thus: glutamate, excitatory neurotransmitter in the central nervous system present in 90% of synapses, stimulates/sustains the neuroplasticity mechanisms of memorization and learning (CASI/Ik), and is involved in Parkinson's disease [14]; GABA is a main inhibitory neurotransmitter in the central nervous system, inducing calming states, the lowering of heart rate and blood pressure (MIS/Ia), which can be enhanced by relaxation, profound breathing and meditation; dopamine creates a temporary sensation of pleasure (IES/II), like in drugs/video gaming/gambling/shopping addiction, followed after that by depression, and stimulates the wakefulness state (CASI/Ik)/(CDC/Iw), insulin releasing from pancreas (MIS/Ia), coordination of the voluntary movements (CDC/Iw) and automatic motor-abilities, involved with glutamate in epilepsy and seizures; adrenaline (epinephrine) transmits the “fight or flight” neuropsychological reaction to threat and fear (IES/II), triggered by amygdala [15] – the alarm device of the body, adapting/stimulating the heart rate, oxygen supply to muscles (MIS/Ia), and the decision making (CDC/Iw) under stressful conditions; serotonin promotes appetite and the satisfaction state after eating in relation with the digestive tract and metabolism (MIS/Ia), wellbeing and happiness in the brain (IES/II), but also can create paranoia, impair judgement, and negative impact to memory (CASI/Ik); oxytocin is related with hypothalamus/pituitary gland activity and intervene in the uterus contractions during the birth process and the release of milk after, and in the loyalty/trust state in social/family relations (GTS/Ic); acetylcholine activates the neuro-muscular junctions for conscious/unconscious movement of muscles (execution elements), for heart and peristaltic activity of the digestive tract (MIS/Ia), but also is involved in learning/memory (CASI/Ik) and in Alzheimer's disease.

The processing of information storing in the brain (CASI) appears to be a result of a fragile dynamic balance between change and stability of the neuronal networks, assisted by a synaptic strength and the synchronization of a dynamic/rhythmic electromagnetic field with various frequencies, which lead toward a long-lasting modification for info-incorporation in the brain network cells. The synaptic strength is defined from the functional point of view as the average amount of current or voltage excursion produced in the postsynaptic neuron by an action potential in the presynaptic neuron. More precisely, this is determined in a multiplicative way by the probability/frequency of the presynaptic release of neurotransmitters and the induced “fired” current/voltage excursion, corresponding to the release of a neurotransmitter vesicle [16]. In the last decade of researches, it became evident already that a full understanding of the processes of memory and learning should include the consideration of the properties of an individual neuron cell within the frame of the concerted action of the brain cell network, and the functional participation of larger-scale networks, mainly by the so called long-term potentiation (LTP) process [7], which is defined as an increase in synaptic strength that lasts for at least 1 h [17]. In terms of synaptic plasticity, that is referred to the information-induced modifications in the efficacy of synaptic transmission (functional plasticity) and changes in the structure and number of synaptic connections (structural plasticity) [7].

However, for a long-term integration of information in memory, the epigenetic mechanisms must be considered, which involve a repetitive/intensive informational stimulus, inducing a chain/cascade of internal reactions in the cells of the brain via CASI/CDC (frequent/intensive processing) + IES (emotional amplification) => MIS (automatic/stereotype ability) => GTS (modification of the gene proprieties, with



a high probability to the transmission of the new acquired trait to the IGG of the next generation [18,19]. This is an informationally-assisted process of structuration, which can be schematically represented by the reaction $A+B+I \rightleftharpoons (AB)(I)$, where A and B are two components forming a new material structure (AB), with the participation of information I, incorporated/"embodied" into the composed structure (AB) as a hidden information (I) during the forward (\Rightarrow) process, which can be released by a reverse (\Leftarrow) decomposing process [5,6].

Such a relation describes schematically the basic mechanism of a typical structuration/destructuration process in the living organisms, both at the level of individual cell and body itself. By biological creation, according to the informational model of consciousness, we have to understand the activity of GTS and IGG, reflected in mind by Ic and Icd (Figure 1 right bottom side), consisting in the creation of a new physical individual. This is a reproduction process by means of GTSs of the parents, who transmit the physiologic/psychological features to the new individual by IGG. At the cellular level, this is equivalent with the replication process (the splitting of the DNA molecule to form a new daughter DNA identical structure for mother-cell reproduction), and with the transcription/translation processes for the formation of the necessary proteins (the bricks of the material structure of the body), for cell/body growth and (re)generation. The informational "language" of DNA is based on sequences of "words" (instructions) formed with the four letters "alphabet" represented by the nucleotides between the two strands of DNA molecule, which are adenine (A), guanine (G), cytosine (C), and thymine (T). Within these structures, (A) is paired only with (T) and (C) only with (G) as complementary units. These are transferred to mRNA (ribonucleic acid messenger) in the transcription/translation process, or copied to form an identical structure within the replication process. This is a beautiful structural/material creation patented by nature for biological reproduction, defined within the informational model of consciousness by GTS/Ic and IGG/Icd, a distinct situation from the creation and creativity as informational concepts, characteristic for the info-operability of the mind ($CASI/Ik \rightleftharpoons CDC/Iw$) and IES/Il intervention, working with pure informational concepts of mind "dictionary", permanently improved. As a final note, we have to observe however that $CASI \Rightarrow CDC$ and $DNA \Rightarrow mRNA$ are actually communication processes, although in distinct language systems.

The advances in the science of information and technology [20] and in artificial intelligence, concerning the memories [21], the learning machines and big data analysis and prediction processes [22], shows/stimulates a good possibility for the application of these tools in the investigation of human information-related processes and connected phenomena.

Conclusion

It was shown that we have to distinguish basically between two types of information: the mental information, referring to concepts resulted from the interaction with reality, i.e. information as significance, information as communication, information as a result of the mind operability, and mater-related information, which actually support the informational stream of the informational agents in the human body and structuring/restructuring processes absorbing/releasing information.

In order to clarify a series of concepts referred to information, info-creational field, creativity and creation, the structure of the informational system of the human body was taken into consideration for an adequate analysis of the mind operability, which allowed to define the thought as an informational operator on the info-creational field of mind – the data luggage acquired in memory. The close relation between memory and the center of the decision and command was highlighted, consisting in the searching/acquisition of the necessary information from memory, the analysis, judgement and decision by

the informational processing with emotional participation, and the transference of the new created information back in memory. It was possible to define therefore the mental creativity from informational perspective, as a concept characteristic to the cognitive-sentient operability of the CASI-IES/CDC systems, able to find/discover/built a new organized/coherent set of data as a product of the creativity process.

To reveal the contribution and operability of matter-related information in the human body, there were discussed in terms of the informational model of consciousness the carriage/transfer mechanisms of information in the brain and human body, by electrical, chemical and genetic components, showing that the biological creation is referred strictly to the activity of GTS and IGG, managing the informational processes by structuring/destructuring mechanisms assisted by the integration/release of information.

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Conflict of Interests

No any.

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