

**PROBLEMS OF BIOCOSMOLOGICAL ANTHROPOLOGY.
SLEEP -WAKEFULNESS CYCLE WITH MAN AS A FORM OF LIFE
ADAPTATION WITHIN THE CONTEXT EARTH-COSMOS**

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Abstract

Our paper is an attempt to study *the couple sleep-wakefulness using the method of fundamental astronomic interfaces of terrestrial environment integrated in Cosmos*. We are looking upon sleep-wakefulness cycle *from the viewpoint of General Anthropology, Individual's Anthropology and Biocosmological Informational Anthropology* bearing in mind the *strictly individual character* of this couple with distinct psychic states: unconscious while asleep and conscious when awake. We started from a series of questions concerning the *causes and adaptive benefits* that oriented man's evolution towards selection of certain characteristics of the sleep-wakefulness cycle during anthropogenesis and ontogenesis. These characteristics may be apparently contradictory or even unfavourable. We analyzed this couple from the point of view of evolutive adaptation to complex interfaces Earth-Moon-Solar System-Cosmos, using a theoretical, symbolic matrix arrangement having as constituting elements the effects of the interdependence of the *four connected interfaces* correlated with the method of Aristotle's Four Causes. We tried to highlight the *unity and complementarity of the Sleep-Wakefulness states* and the *complementarity Unconscious-Conscious* that defines them, by means of adaptive evolutive characteristics. They answer to several questions mentioned in the introduction of the paper regarding the *causes and adaptive benefits* of the sleep-wakefulness couple.

Key words: sleep-wakefulness complementarity, fundamental astronomic interfaces, *individual's anthropology, biocosmological informational anthropology*, unconscious-conscious complementarity

Motto

“Any object is a form of light, caught in a structure.”
“Wonder stops time, and the natural, on the contrary, unleashes it.
Time is in fact light. In this sense the smallest time unit is the photon.”
“The conversion of light into existence and the conversion of existence into light,
as I imagine it now, may be a metaphor. But what if it is not only a metaphor?”
Nichita Stanescu (Romanian poet)

Introduction

Our study deals with the phenomenon of *cyclicity and complementarity* of the fundamental states of human existence the states of sleep-wakefulness (S-W) from the points of view of *General Anthropology, Biocosmological Informational Anthropology and the Individual's Anthropology*. Specialized literature regarding the state of sleep (S) and the state of wakefulness (W) is vast owing to the complexity of these states and to the many directions of interdisciplinary approach of the respective states (Carskadon M.A. and Dement, W.C., 2011; Waterhouse Jim, et al, 2012). Neglecting or underevaluating the part and importance of the sleep-wake cycle (S-W) under the circumstances of the present stressing life, may lead to human exhaustion and degradation or even to man's disappearance as evolutive species. The **motivation** of the present study starts from the following questions:

What are the causes and adaptive benefits that led to selection of certain characteristics of the S-W couple with modern man, such as:

1. *Relatively long duration of S state* of approx. 7-9 hours of sleep out of 24 hours of one day. Does it mean that 1/3 of a lifetime man must sleep in order to survive under normal physiological conditions?
2. *Horizontal position in S state*, perpendicular on the direction of vector gravitational force, within the context of the anthropogenetic process of "verticalization"?
3. *Great physical, corporeal vulnerability*, in the state of unconsciousness, *in S state*, respectively in the adaptive-evolutive process of rendering aware and survival which is characteristic of man?
4. *The necessity to diminish or even drastically suspend*, while sleeping, the participation of the sense organs specific of man and the *appearance of the phenomenon of virtual "paralysis of the body"*, in REM sleep?
5. *Multi-cyclic interdependence dreamless sleep* (NREM - non-rapid eye movement sleep) – *sleep with dreams* (REM - rapid eye movement sleep)?
6. *Interdependence between energies and metabolized information* in REM sleep "seeing with closed eyes" (dreams) and the energies and metabolized information in case of 'seeing with open eyes' in W state?
7. *Interdependence between the energies and practically infinite information* inevitably received by the human body from the environment and the energies and highly limited information processed by specifically human sense organs?
8. *Keen awareness of the importance of the S-W couple and the consumed energy* by human society in order to ensure sleep security by building a place to live in for protection: from the grotto to the luxury hotel room?
9. *Intrinsic interdependence between S-W couple human state* and the unconscious-conscious states?

10. *Interdependence between unconscious “vegetative” state in man’s S state and the natural state of complete immobility of plants* endowed with a very diverse information processing without specialized sense organs, having in view the unity of the phylo and anthropogenesis process?

11. Resemblances between plants ‘fixed- unmovable’ state and the states of coma, meditation, NDE (Near Death Experience) and human S state?

12. Interdependence between *human knowledge and creation* offered by the information processed during W state and knowledge and creation ‘experienced’ during S state?

13. Interdependence of *personal feelings offered by the dream state*, individual variability in point of its *remembering* (Jung, C. G., 1964) and the process of adaptive evolutive selection ? What is the significance of what we remember about our dreams in W state? (Franz Marie-Louise von, 1999).

We obviously cannot answer the 13 questions above in this paper. We have tried to pursue a simplified and, at the same time, integrated way of thinking regarding a *methodology of anthropological approach of these couples of human states*. We suggest a thinking and study method that should lead to relatively simple, coherent, valid answers open to include the new anthropological and interdisciplinary discoveries and experiments made so far (2016), from nanomedicine, maybe in the perspective of “nanoanthropology”, to biocosmology and the sciences of the Universe.

A strictly personal motivation for the problems approached here is that I myself, the author of this study (Cornelia Guja) slept relatively little in my youth and during my mature age (max. 5-6 hours /day) and in my sleep in dreamed a lot. At present, at senescence, I sleep more (about 8 hours out of the 24) and I dream much more. I am looking forward to dreaming and being left with the sensation of living new, unknown life experiences. After I wake up I feel very keen on understanding whatever happened in my dream state. The dreams are rich in content, varied, sometimes very complicated, abounding in details, vexing, exciting, dynamic, difficult to express in words and sometimes I realize they are correlated with my everyday life events. The remnant psychic states in my dreams are sometimes identified in my state of wakefulness at a certain *apparently aleatory* moment of the day. They seem to be in connection with the emotions caused by real events of the moment. Based on this everyday individual *anthropological self-experiment*, as a ‘participant observer’ (Tedlock Barbara, 1991), who may practically be multiplied by the entire diurnal cyclic experience of the population on the whole Earth, I initiated, years ago and developed in time preoccupations that I considered to belong to the Individual’s Anthropology <http://www.corneliaguja.home.ro->] and especially to *Biocosmological Informational Anthropology* (Guja, 2013a; <http://corneliaguja.blogspot.com/>).

The purpose of the present study is to make a brief analysis of the physical, biophysical-biochemical, ecological, anthropological, geophysical and astronomic causes that determined selection of the S state during anthropogenesis, maintaining of an important time budget in man's life and development of a specific sociocultural sleeping behaviour, significant in man's household (bedroom). The study attempts to approach these two vital states of man's W-S cycle within the framework of complementary general anthropological coordinate system: *space/time, energy/information, homeostasis/variability and unconsciousness/consciousness*. With these methodological landmarks, which I considered here fundamental anthropological coordinates, one can better describe the various adaptation categories of the human being to the terrestrial and astronomic context in which it evolved by means of various forms of adaptive effects. In my career, I studied these forms in the Individual's Anthropology and Biocosmological Informational Anthropology. (Guja, 1985-2015)

Our study hypothesis refers to the human cycle, sleep state – wakefulness state (S-W) as a unitary, complex: adaptive, evolutive and complementary process, capable to offer extended anthropogenetic cognitive informational capacity to terrestrial and astronomic cosmic conditions in which man lives. In other words, human conscious W state is an evolutive adaptive state complementary to S state. The duration of the relatively extended S state occurs when conscious cognitive capacity, evolutively gained during anthropogenesis, is reduced and maintains a universal unconscious cognitive informational capacity which is permanently enriched in ontogenesis. Consequently, the sleep-unconscious state, as initial, primordial state, complementary-contradictory to the wakefulness-conscious state, acquired later, adapts us to extended forms of reception and information processing, acquired phylogenetically and stored in the human evolutive, anthropogenetic genetic code. In this way a *human interface of conscious-unconscious evolutive knowledge* develops, which includes extended Quantum- nano-micro-macrocosmic possibilities of information processing, the information coming from the entire experience of the living world and evolutively contributing to anthropogenesis.

We further briefly mention that the **object of study for General Anthropology** is human collectivity approached in its anthropogenetic evolution (Birx, 2006). **The object of study for Individual's Anthropology** initiated and developed by us (Guja, 2008) is the human being, fundamental structural unit of human collectivity, indivisible (anthropologic archetypal model similar to the atomic model for the unliving matter), self-aware and aware of the surrounding reality. Man is approached as a *system, and at the same time as an interface of archetypal informational communication between nano-micro and macrocosmos*, being organized according to universal archetypal structural forms. The human being is studied as a spiritual *biopsychosociocultural entity*, communicating information to and from its inner and outer living environment in a paradoxical way: complementary-contradictory,

biologically-culturally, subjectively-objectively, consciously-unconsciously. Its functional state is *a state of multiple, complex coexistence by means of interfaces and cyclic processes, complying with universal evolutive patterns* (Guja, 2008 c, d and 2012). **The object of study of Biocosmological Informational Anthropology**, in our acceptance is: Biocosmological Anthropology is the study of humans, past, present and future, integrated in Cosmos, from the point of view of informational archetypal communication: coded, symbolic, cultural, conscience.
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It is worth reminding that the objective of the present paper is based on questions 1-13 above and intends to find a theoretical, interdisciplinary anthropological framework that should enable finding the answer to the *generic question: what are the causes* (primary, secondary, complex) and especially *what is the reason why* (adaptive and evolutive advantage) during anthropogenesis and ontogenesis, the complementary fundamental S-W cycle was selected to the *unique* subspecies *Homo sapiens sapiens* (of *Homo sapiens species*)? We have in view the great variability of the manifestations of this S-W state with millions of species existing on the earth, selected in the evolutive process by phylogenesis, and its variability within the human species.

Material and Methods

As mentioned before, our theoretical anthropological approach cannot be fully described in this paper; we will therefore mention a few data from specialized literature in connection with the complementary couple S-W. We consider these materials necessary for understanding the purpose of this study. We will mainly pursue the aspects regarding the causes and advantages of adaptation, evolution, homeostasis and biopsychosociocultural variability, having in view, in the first place, information *unity and interdependence* that define complementarity between S-W states.

Human S state is a natural, cyclic state characterized by temporary suppression of consciousness, by partial abolition of the general sensitivity of the body and slowing down of the functions of organic life (respiratory rhythm, cardiac rhythm, muscle relaxation, diminishing of secretory functions, temperature lowering by approximately 0.5 C degrees). *S state takes about 1/3 of man's life and requires a specific biochemical, energetic, information and Quantum behaviour and metabolism. Human natural sleep* is difficult to study in the laboratory. It starts when one feels the need, irrespective of one's personal will, and its quality determines the way W state develops. We know today that normal sleep with man is periodical, and occurs in two distinct ways that alternate cyclically, identified as: dreamless sleep (non-REM, of about 70-90 minutes) and sleep with dreams (REM of approx. 10-20 minutes). This sequence repeats at least 5 times during one night. *REM sleep also*

includes the paradoxical aspect known as virtual paralysis of the entire body)) (Dispenza, 2008). S state, when the conscious state, characteristic of W state, is suspended and general sensitivity is suspended, is felt in the W state as a means to recover the energy of the body after a period of activity. From the point of view of physiological investigations, S state resembles the states of exhaustion which trigger lack of activity, coma, trance, with “temporary apparent death” or the animals’ state of hibernation. Electromyogram (EMG) traces of skeletal muscle activity show that, while the body is effectively completely paralyzed during REM sleep, the body does make some limited movements during non-REM sleep, including a major change in body position about once every twenty or thirty minutes on average. Based on these characteristics, early sleep researcher William C. Dement has described non-REM sleep as an idling brain in a moving body, and REM sleep as an active hallucinating brain in a paralyzed body (*Dement and Vaughan, 2000*). While dreaming (REM episode), the human being experiences during its sleep, *strictly individual feelings*.

State corresponds to a state of *cerebral activity* characterized by temporary disruptions of the conscious contact with the internal and external medium. *Vegetative functions* diminish (breathing, circulation, digestion), so do metabolic functions (energogenesis and oxygen consumption are reduced). The frequency of respiratory movements and flow rate decrease. Bradycardia occurs, lowering of cardiac flow and blood pressure. Secretions and digestive peristaltic activity are diminished as well as the function of the urinary system. During one’s sleep *somatic changes* also take place. *Muscle tone decreases, the activity of the locomotor system ceases*. The mechanisms causing sleep are passive and active. *Passive sleep* may be induced by creating special surrounding conditions (silence, darkness and monotonous stimuli), at the same time with attitudes that allow maximum reduction of visual and somatosensory afferents: horizontal position and closed eyes. S state has a reversible character. Passing from W state to S state and vice versa is normally easy and takes place in a few seconds. *The circadian biorhythm was formed during the phylogenetic history of the species*. It has endogenous generating mechanisms but is strongly influenced by exogenous stimuli. The coincidence sleep-night, wakefulness-day is reversed with certain species, according to their adaptation to the environment (beetles, some birds, mammals) An important part in controlling biorhythm is played by diencephalon and reticular formation. Lesions of the Hypothalamus determine continuous sleeping (sleeping sickness). Sleep duration varies according to age. Sleep may be artificially induced by means of sleeping pills or general anaesthesia. This kind of sleep is not so easily reversible as the physiological one. *Sleep state is not homogeneous*. During one’s sleep *cyclic stages of neuronal activity* (paradoxical sleep) occur, characterized by *electroencephalographic modifications (rapid waves), eye movements and dreams*. These stages alternate with periods of sleep, with slow electric waves, without dreams (common sleep). Long periods of sleeplessness may cause, both in humans

and animals, behavioural disorders and even metabolic changes. Reversing the night-day rhythm or change of the time zone places an additional burden on the body that needs to adapt to the new biorhythm. During the fetal period sleep characterizes the longest part of intrauterine evolution. During *ontogenesis* (time interval from birth to death) the characteristics and type of sleep, its duration and efficiency change. Newborns sleep a lot, about 18 hours out of the 24 (Bertolo, 2003). *We begin our lives sleeping and dreaming ¾ of the 24 hours*. After formation and consolidation of human life routine and after formation of circadian rhythm, newborns start having wakefulness periods alternating with long periods of sleep, about 14-15 hours a day. Teenagers sleep about 9-10 hours, young adults and grown ups about 7-9 hours while older adults over 65 sleeps about 5-8 hours a day. *S state proves to be strongly implicated in man's biological and cultural evolution. Man has a specific sleeping behaviour in specially organized protected domestic conditions (Franz Marie-Luise von, 1978). In S state recovery is on multiple layers: substantial, energetic, informational and psychic (characterized by a psychoinformational metabolism at Quantum level).*

Way state is the physiological cyclic state of feeling and activity in which the human being leads his life consciously, under the influence of the stimuli in his inner medium (inside his own organism) and in the outer medium (from the terrestrial, astronomic and cosmic context). It is a deeply socially implicated state. During the process of selection and processing of the huge amount of internal and external information received by the human body, it got adapted and structured specific systems of perception and sense organs, useful for survival and supervival. They improved during anthropogenesis which gets adapted and mature in ontogenesis by development and plastic evolution of the brain, consciousness and self-awareness (Dispenza, 2007). The information processed by the specifically human senses is adapted only to *certain relatively reduced intervals of values and types of factors* in comparison with the entire range of possibilities of the stimuli incessantly affecting the body- e.g.: for sight, from the *range of optical electromagnetic waves*: only for the interval 400-700 nanometers (nm), *for sound waves* between 20 and 20,000 hertz, *for olfaction, taste and tactile sense* there are also only limited stimuli as compared to their practically infinite number. Vision is our dominant sense. The simplest eyes, such as those in microorganisms, do nothing but detect whether the surroundings are light or dark, which is sufficient for the entrainment of circadian rhythms. From more complex eyes, retinal photosensitive ganglion cells send signals along the retinohypothalamic tract to the suprachiasmatic nuclei to effect circadian adjustment and to the pretectal area to control the pupillary light reflex. Photoreception is phylogenetically very old, with various theories of phylogenesis. Eyes in various animals show adaptation to their requirements. For example, the eye of a bird of prey has much greater visual acuity than a human eye, and in some cases can detect ultraviolet radiation.

The concept of complementarity in our study refers to that special type of interdependence owing to which the two states S-W achieve an evolutive functional integration: “a relationship or situation in which two or more different things improve or emphasize each other's qualities”. ‘Mutatis mutandis’ we wish to take over the significance of the concept of complementarity from the complementarity principle in Physics: “the concept that two contrasted theories, such as the wave and particle theories of light, may be able to explain a set of phenomena, although each separately only accounts for some aspects”. Objects have complementary properties which cannot be observed or measured at all at the same time. ([https://en.wikipedia.org/wiki/Complementarity_\(physics\)](https://en.wikipedia.org/wiki/Complementarity_(physics))) The idea is to benefit from the thinking that unites the two theories in Quantum Physics referring to the two complementary aspects of an elementary particle in the structure of matter, the states of corpuscle and wave, of material behaviour (substance) and of information-undulatory behaviour of matter. We obviously tried to transfer the concept of contradictory-complementarity by adapting it to the complex organizing nano-micro-macroscopic levels at which man is in the states of S and W, *analyzed at the level of central nervous system as material substratum, and also undulating, as a receiver and generator of energy and information in S and W states.* (Hameroff, and Penrose, 2014; Soresi, 2013).

Cyclicity of the S-W couple is the result of the interaction between rhythmicity of the internal metabolic processes of the organism with rhythmicity of the *energies of the magnetic, electric, electromagnetic and terrestrial, lunar, solar gravitational fields of the planets and cosmic radiation.* The circadian rhythm manifests itself at biophysicochemical, atomic, molecular, cellular, organic, systemic, biophysicoendocrine, mental and behavioral levels. It is an adaptive response, *in the first place*, to cyclicity of electromagnetic energy (darkness-light) which is due to the double rotation of the Earth around its own axis in 24 hours and annual on the ecliptic, around the Sun. Rhythmicity at individual level is very complex owing to the interaction of the material, energetic, informational and Quantum factors in the internal medium of the individual with the external and especially cultural factors, extremely variable during anthropogenesis (dynamic cultural geophysical factors) (Birx, 2006). These rhythms are also to be found with most of the living organisms, including microorganisms, plants and animals. Human species has structured ‘an internal, cerebral interface’ which controls the fundamental rhythms of the organism. This coordinating interface may function and ensure a normal state of health, but may also be disrupted, causing serious disturbances to S state and W state (Carskadon and Dement, 2011).

The study of *complementarity of human S-W fundamental cycle* may theoretically develop within a framework with general anthropological coordinates, as shown before: *space-time, energy-information, homeostasis-variability, unconsciousness-consciousness*, which refers to the life context in which the *human*

species evolved and was selected as a unique species out of millions of species that lived on the Earth. These natural landmarks should include the *specific processes* that made *Homo sapiens sapiens* different from the rest of the living world: *verticalization, lateralization (body bilateral functional symmetry-asymmetry), encephalization, awareness, spiritualization, etc.* (Birn, 2006). Natural cyclic sequence of S-W states is a requirement of human life alongside with the fundamental processes of *breathing (oxygenation by energetic biochemistry) feeding (body construction by substance metabolism) and reproduction (organism multiplication by genetic informational metabolism)*. S-W complementary cycle is characterized by distinct essential psychic peculiarities. S-W states are functionally dependent, succeed one another cyclically and represent, in a certain anthropological meaning, two opposite poles of human existence: a latent state (potentialized) and an active state (updated). Human S-W states are therefore complementary from several points of view: functional, energetic, informational, psychoneuroendocrine, behavioral, of logic thinking (like *unconscious state for S and conscious state for W*). (Lupasco, 1979).

The S and W states are difficult to define clearly even today because of various reasons: lack of certain adequate methods and technologies, unitary study principles for human specificity and the *absence of an adequate coherent anthropological theory*. This should include the paradox of unity and unicity of human species, which is developing permanently by self-aware active everyday life, within the specific astronomic terrestrial-planetary-solar context and *individual variability* which defines human personality.

In our study method we will consider „human being” entity as a *complex interface of nano, micro and macrouniverse* which can be described to be in two fundamental states for its existence. The *fundamental sleep state* is the state in which man is in a special physiological posture, *horizontal*, relaxed, with diminished mobility and sensory reactivity and unconscious psychic status. The *fundamental wakefulness state* is the state in which man is mobile, lives his life actively, in vertical position (owing to verticalization process) and conscious psychic status (owing to the process of encephalization, awareness and spiritualization, specific of man).

In the works published during my career, including recent years, I have described, developed and applied in anthropological analyses ‘integronic thinking’ and the method of interfaces applied to the study of ” informational evolutive adaptation to the four fundamental astronomic contexts-interfaces” correlated with ” Aristotle’s method of the four causalities” (Guja, 2013a,b and 2014). I associated to each successive, fundamental terrestrial astronomic context one of the four causalities considering that they are due to dominant factors of these contexts. We think that correlation of these astronomic contexts with Aristotle’s four causalities opens an interesting perspective and that understanding the relations between these

causes and their effects on the forms of adaptation to the complex life ENVIRONMENT is very useful: Interface (I), Terrestrial-material, Lunar-formal I., Solar-efficient I. and Cosmic-final I., Figure 1.

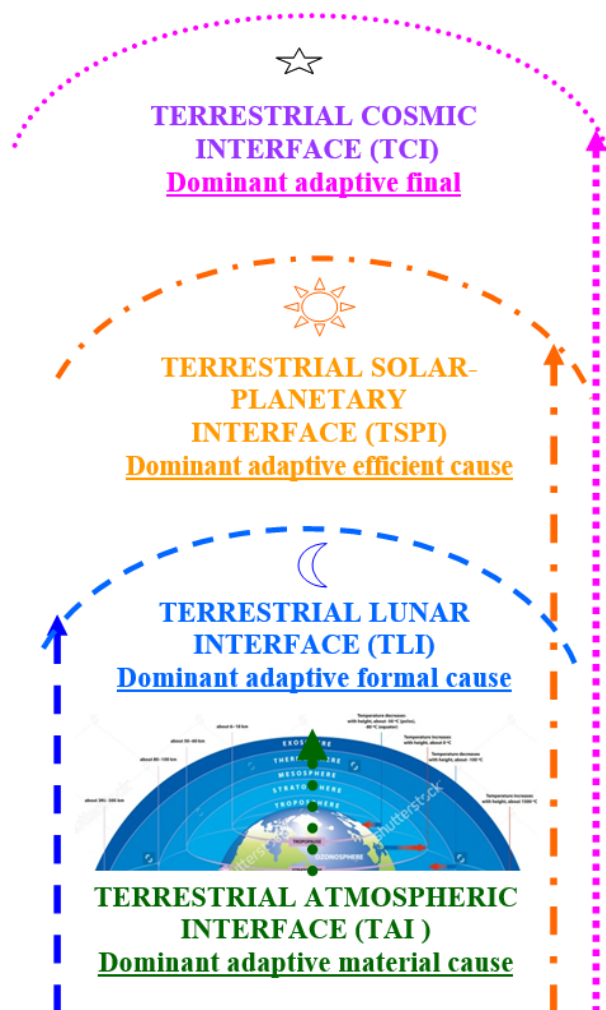


Figure 1. - Schematic representation of our life ENVIRONMENT within the TERRA-Cosmos astronomic context made up of four fundamental astronomic interfaces *which overlap, have simultaneous action and contain* the source of the causes of our terrestrial existence. We theoretically associated one of Aristotle's causalities to each interface as the *dominant cause* of the respective context. We saw possible dominant correlations of *evolutive adaptation* of living systems, *fundamental* terrestrial interfaces and Aristotle's Causes. (Guja, 2013a, b and 2014)

Using a theoretical, symbolic matrix arrangement with *component elements* regarding the interdependence of these interfaces and Aristotle's four causes we highlighted a more detailed form of the respective interdependences. The matrix of these interdependences enables phylogenetic and anthropogenetic processes to be classified in multiple coordinates. It mirrors the characteristics of certain effects such as diversification, variability and specificity of interhuman interactions owing to multiple adaptive interconnections by the appearance of consciousness as man's form of adaptation to the hypercomplex context Earth-Moon-Sun-Cosmos, such as the S-W cycle we are studying.

Results and Discussions

The method of analysis we suggested by using the matrix ordering form helped us express more explicitly the hyper complex interdependences of the causes manifested during our anthropogenetic evolution. The anthropological coordinates may help us classify the studied life processes more thoroughly: we may become aware of the fundamental couple S-W and decode its laws in order to manage it in a more reasonable way. *The results obtained with our method refer to discerning the fundamental causes whose 'effects' are ourselves.*

We will further present and discuss briefly the theoretical matrices in Tables 1 and 2, which comprise the interdependences of the fundamental terrestrial interfaces 1-4, to which *we associated* Aristotle's four causes as follows: 1. *Terrestrial Interface (I) - material cause*, 2. *Lunar I. - formal cause*, 3. *Solar I. - efficient cause*, 4. *Cosmic I. - final cause*. We tried to place the S-W cycle, in a coherent and unitary manner, within the proposed fundamental anthropological coordinates: *space-time, energy-information, homeostasis-variability and unconsciousness-consciousness*.

In Table 1 we tried to analyze the fundamental processes of humanization as an effect of the four well-known fundamental interacting physical forces: *gravity, electromagnetism, strong nuclear and weak nuclear interaction*. We found it useful to attach to them the interactions resulting from *cosmic radiation* and other causes unknown to us yet (they may also be fundamental causes). If we follow the matrix diagonally, elements I/1 – IV/4, we suggest that the *dominant effects* consist in the *humanizing* characteristics accepted today. The process of *verticalization* (I/1) is the *material dominant effect* of terrestrial interface, seen in physical aspect, in the body and the entire physiology of the human organism. It is the resultant of the action of the dominant gravitational force on the Earth cumulated with the gravitational forces of the Moon, Sun and Cosmos. *Lateralization* (II/2), symmetrical or asymmetrical, as formal dominant effect, associated by us with astronomic interface Earth-Atmosphere-Moon is the fundamental humanizing process that

offered a convenient optimum solution for the entire living world. This process was also taken over by anthropogenesis with the respective evolutive advantages in cerebral lateral specialization. (Birx, 2006). Earth-Moon Interface brought about a great range of possibilities of ecological, phasic lunar cyclic variability of the forms of life adapted to this peculiarly terrestrial astronomic conjuncture. The process of encephalization (III/3 seems to be the dominant effect of the efficient causes that stimulated competitive, selective, evolutive adaptation in Earth-Moon-Sun Interface. Earth-Sun Interface brought about the source of life energy with its entire range of possibilities of astronomic temporal variability. Along the diagonal in position (IV/4) one may place the most enigmatic capacity acquired by man: consciousness, which implies individual experience with the entire genetic cognitive patrimony accumulated phylo and anthropogenetically, in a conscious and unconscious manner.

1-4 ASTRONOMICAL INTERFACE - Aristotle Causes ----- I-IV Fundamental Natural Interaction	1. TERRESTRIAL ATMOSPHERICAL INTERFACE Dominant Material Cause	2. TERRESTRIAL LUNAR INTERFACE Dominant Formal Cause	3. TERRESTRIAL SOLAR-PLANETARY INTERFACE Dominant Efficiency Cause	4. TERRESTRIAL COSMIC INTERFACE Dominant Final Cause
I. Gravitational: terrestrial, lunar, solar, planetary and cosmic fields	I / 1 Structural Variability VERTICALIZATION	I / 2 Cyclical Variability	I / 3 Homeostatic Variability	I / 4 Quantistic Variability
II. Electromagnetic (Electric, Magnetic fields)	II / 1 Biophysical-biochemical Variability	II / 2 Physiological Variability LATERALIZATION	II / 3 Electrodynamics Variability	II / 4 Nanoscale Variability
III. Strong Nuclear and Weak Nuclear fields	III / 1 Genetic Variability	III / 2 Ecological Variability	III / 3 Psychical Variability ENCEPHALIZATION	III / 4 Psycho-information Variability
IV. Cosmic Radiation and other unknown sources of Information	IV / 1 Species Variability	IV / 2 Typological Variability	IV / 3 Informational Variability	IV / 4 Individual Variability CONSCIOUSNESS

Table 1. Theoretical, symbolic matrix of the dominant effects in the *fundamental humanizing processes* as a result of the complex interdependences of the astronomic terrestrial interfaces associated with Aristotle's Causes, which are under the influence of the fundamental interacting *sources (forces) well-known in nature* (information sources). The processes highlighted on the diagonal of the matrix may be the resultant of the action of all dominant factors selected in anthropogenesis in order to ensure, biologically and socio-culturally, human evolutive survival and supervival.

In the matrix in Table 2 we tried to analyse the *processes that define the S-W cycle*. We selected as fundamental evolutive causes (processes) of life: I. Cyclicity, II.Adaptation, III.Metabolism and IV.Informational variability. Taking over the resulting information in Table 1 and looking at the fundamental humanizing processes in Table 2 we materialize this way of analysis by introducing already known characteristics of S-W couple. Using the same reasoning presented when analyzing the results in Table 1, we ordered on the diagonal of Table 2 as dominant effects: I/1 diurnal cycle S-W with its characteristic gravitational positions horizontal-vertical; II/2 *energetic metabolism* S-W, differentiated for the two states; III/3 visually dominant sensory adaptation of cybernetic type in both types sleep REM-NONREM and (IV/4) internal and external, archetypal, symbolic, cultural universal communication we establish while dreaming (night and day) by means of cerebral structures at all levels of communication known and unknown (biophysicochemical, psychoinformational, nanometric, quantum or other forms of existence).

1-4 ASTRONOMICAL INTERFACE- Dominant Aristotle Causes ----- <u>I-IV Fundamental</u> Evolutive Processes	1. TERRESTRIAL ATMOSPHERICAL INTERFACE- Dominant Material Cause	2. TERRESTRIAL LUNAR INTERFACE- Dominant Formal Cause	3. TERRESTRIAL SOLAR- PLANETARY INTERFACE- Dominant Efficiency Cause	4. TERRESTRIAL COSMIC INTERFACE- Dominant Final Cause
<u>I. Cyclicity</u> Regular recurrence, rhythm stability	I / 1 S-W Dominant <u>Diurnal Cycle</u> HORIZONTAL- VERTICAL	I / 2 Lunar- phase Cyclicity	I / 3 Annual- seasonal Cyclicity	I / 4 Cosmic Cyclicity
<u>II. Metabolism</u> Relatively stable equilibrium by homeostasis	II / 1 Biophysic- biochemical Metabolism	II / 2 S-W Dominant <u>Energetic Metabolism</u> SLEEP-WAKEFULNESS	II / 3 Psycho-informational Metabolism	II / 4 Quantistic Metabolism
<u>III. Adaptation</u> Evolution by means of natural selection.	III / 1 Selective Adaptation	III / 2 Ecological Adaptation	III / 3 S-W Dominant <u>Cybernetic Sensory Adaptation</u> REM-NONREM	III / 4 Cognitive Adaptation
<u>IV. Informational variability</u> Changes in heritable traits	IV / 1 Physical Variability	IV / 2 Functional Variability	IV / 3 Psychological Variability	IV / 4 S-W Dominant <u>Cultural, Archetypal, Universal Communication</u> DREAM

Table 2. Theoretical, symbolic matrix of the *effects upon Sleep-Wakefulness (S-W) determined by the resultant of the complex interdependences* between the astronomic terrestrial interfaces associated with Aristotle's causalities under the action of the *fundamental processes of human evolutive selective adaptation*. The processes highlighted along the diagonal of the matrix may be the *resultant of the*

action of all fundamental dominant factors selected in anthropogenesis of human S-W cycle. The ones complementarily placed top- right and bottom-left belong respectively to the sleep state (blue colour) and wakefulness state (yellow colour).

In Tables 3 and 4, in order to analyse in more detail the adaptive effects studied in S-W cycle, using the matrix modality of ordering the various categories of interdependences, we associated this time *the four causalities* to *each of the four fundamental astronomic interfaces*. Taking over the results pointed out in the previous matrices from Tables 1 and 2 and keeping the same interpretation procedure we will observe the matrix elements on the diagonal and then globally the ones top-right and bottom –left. In Table 3 we can systematically watch the distribution of multiple interdependences, possible among the four interfaces and Aristotle’s four causalities. The elements (effects) along the diagonal may be distinguished according to the dominant causes in dominant effects: biological (I/1), ecological (II/2), selective (III/3) and *evolutive* (IV/4). An attentive examination of the elements of the matrix on both sides of the diagonal leads to the idea that they seem to be effects of certain complementary interdependences that contribute to the dominant processes of the diagonal: sleep and wakefulness.

In Table 4 we applied whatever resulted from Table 3. We specifically referred to the S-W cycle in order to further try to harmonise the already known characteristics of this cycle with the logic offered by the matrix ordering we performed. We will observe the interdependences between the astronomic interfaces and Aristotle’s causalities along the diagonal starting from the matrix element I/1 to IV/4 and then the areas bottom-left and top-right. We notice that we can consider S-W couple a complementary couple together with unconscious-conscious couple placing it on the matrix diagonal. They can be understood like a Bio-Cultural complementary couple (I/1) intrinsically interdependent and unitary of existence, of the fundamental processes of life within the astronomic context Earth-Cosmos. There is also an ecologic-astronomic complementary couple (II/2), cybernetic-evolutive complementary couple (III/3) and unconscious-conscious complementary couple (IV/4). This fundamental status of the human existence is unitary complementary. The two states are permanently interdependent, cannot be separated, and are alternative. They were constituted during phylo and anthropogenesis, in two types of specific interfaces between the human organism and the hypercomplex astronomic terrestrial ENVIRONMENT. The characteristics of the two complementary interfaces, nocturnal and diurnal, may be inferred from the elements placed to the left and right of the diagonal.

Problems of Biocosmological Anthropology.

Sleep -wakefulness cycle with man as a form of life adaptation within the context earth-cosmos

1-4 Aristotle causes ----- I-IV FUNDAMENTALE ASTRONOMICAL INTERFACES	1. Material Cause (MC)	2. Formal Cause (FrC)	3. Efficient Cause (EC)	4. Final Cause (FnC)
I. TERRESTRIAL ATMOSPHERICAL INTERFACE (TAI)	I/1 TAI – MC Dominant <u>Biologic</u> Adaptive Effects	I/2 TAI – FrC Terrestrial-Formal Effects	I/3 TAI – EC Terrestrial-Efficient Effects	I/4 TAI – FnC Terrestrial-Final Effects
II. TERRESTRIAL LUNAR INTERFACE (TLI)	II/1 TLI – MC Lunar-Material Effects	II/2 TLI – FrC Dominant <u>Ecologic</u> Adaptive Effects	II/3 TLI – EC Lunar-Efficient Effects	II/4 TLI – FnC Lunar-Final Effects
III. TERRESTRIAL SOLAR-PLANETARY INTERFACE (TSPI)	III/1 TSPI - MC Solar-Material Effects	III/2 TSPI – FrC Solar-Formal Effects	III/3 TSPI - EC Dominant <u>Selective</u> Adaptive Effects	III/4 TSPI – FnC Solar-Final Effects
IV. TERRESTRIAL COSMIC INTERFACE (TCI)	IV/1 TCI - MC Cosmic-Material Effects	IV/2 TCI - FrC Cosmic-Formal Effects	IV/3 TCI – EC Cosmic-Efficient Effects	IV/4 TCI – FnC Dominant <u>Evolutionary</u> Adaptive Effects

Table 3. Transposition as an extended form of the theoretical, symbolic matrix of the method of astronomic terrestrial interfaces correlated with the method of Aristotle’s causalities. Under this form each fundamental astronomic interface I-IV is successively associated with Aristotle’s Four Causalities 1-4. Each element of the matrix, out of the 16 (4x4), represents a *variant of possible interdependence*. They can be interpreted as *simultaneous selective effects of the interaction of all ENVIRONMENTAL factors (material, respectively formal, efficient and final)*. The processes highlighted in the matrix diagonal may be the resultant of the action of all fundamental dominant factors selected in anthropogenesis in order to *ensure, biologically and socio-culturally*, human evolutive survival. (Guja, 2013a, b and 2014)

1-4 Aristotle causes ----- I-IV FUNDAMENTAL ASTRONOMICAL INTERFACES	1. Material Cause (MC)	2. Formal Cause (FrC)	3. Efficient Cause (EC)	4. Final Cause (FnC)
I. TERRESTRIAL ATMOSPHERICAL INTERFACE (TAI)	I/1 S-W Complementary Bio-Cultural Process	I/2 Unconscious Nocturnal Interfaces	I/3 Unconscious Nocturnal Interfaces	I/4 Unconscious Nocturnal Interfaces
II. TERRESTRIAL LUNAR INTERFACE (TLI)	II/1 Conscious Diurnal Interfaces	II/2 S-W Complementary Astronomic-Ecologic Process	II/3 Unconscious Nocturnal Interfaces	II/4 Unconscious Nocturnal Interfaces
III. TERRESTRIAL SOLAR-PLANETARY INTERFACE (TSPI)	III/1 Conscious Diurnal Interfaces	III/2 Conscious Diurnal Interfaces	III/3 S-W Complementary Evolutive-Cybernetic Process	III/4 Unconscious Nocturnal Interfaces
IV. TERRESTRIAL COSMIC INTERFACE (TCI)	IV/1 Conscious Diurnal Interfaces	IV/2 Conscious Diurnal Interfaces	IV/3 Conscious Diurnal Interfaces	IV/4 S-W Complementary Unconscious- Conscious Process

Table 4. Transposition as an extended form of the theoretical, symbolic matrix of the method of interfaces in which we successively associated Aristotle's four causalities 1- 4, to each interface I-IV (Figure 3). The processes highlighted in the matrix diagonal may be the resultant of the action of all fundamental dominant factors selected in *anthropogenesis of human Sleep-Wakefulness cycle*. The matrix elements placed top-right (unconscious nocturnal interface) and those placed bottom-left (conscious diurnal interface) respectively belong to terrestrial material dominant factors (I/1- IV/1) and to cosmic dominant factors (I/4-IV/4). They are the two components of the complementary S-W cycle of the human organism in its astronomic terrestrial environment, that manifest as nocturnal-diurnal fundamental interfaces.

Under this theoretical aspect we may consider that our working hypothesis has reached a positive result: by matricial ordering and using the already mentioned coordinates and causalities, we mainly tried to bring arguments and even to demonstrate that *human S-W cycle is a unitary, complementary, indivisible, hypercomplex adaptive evolutive process, capable to offer anthropogenetic cognitive informational capacities extended both to terrestrial and to astronomic, cosmic conditions in which man developed*. The duration of fundamental S state (8 hours), approximately half of the duration of W state (16 hours) takes place in certain conditions-reduced conscientious cognitive capacity-gained during evolution in anthropogenesis, but it maintains an unconscious cognitive informational phylogenetic capacity. In this way the entire cognitive and fundamental automatism are preserved and rendered profitable for life preservation. It is permanently enriched in ontogenesis. Sleep in the human REM

nocturnal stage, of evolutive unconscious-conscious evolutive knowledge, includes vast informational processing possibilities: *state of dream (while sleeping) and spontaneous, intermittent state of dream (diurnal, mental)*. Communication in these states takes place at all structuring levels of the organism: system of organs, organs, tissues, cells, molecular, atomic, nanometric, Quantum, having the coordinating place in the human brain (Odobleja, 1938-1939; Hameroff and Penrose, 2014). In this way we could understand more clearly in what way experience gained by the entire world may evolutively contribute to anthropogenesis. *In S state with REM we have direct access to extended knowledge, which enriches personal ontogenetic experience, enabling thus acquiring of new individual evolutive capacities. By learning and making an adequate mental behaviour conscious for the state of sleep one may obtain outstanding performance (Dispenza, 2015).*

Conclusions

- Using the interdisciplinary valences of anthropological sciences and of an adequate theoretical methodology, we analyzed and tried to demonstrate that *the human S-W cycle is a fundamental evolutive adaptive process, which is part of the general context of life and is submitted to its laws*. We systematized and pointed out the multiple terrestrial and cosmic (astronomic) causes which contributed to the process of anthropogenesis of the S-W cycle and bring up new aspects that may answer questions 1-13 whence the study started.

- The modality of *matricial ordering* of the interdependences existing among the general anthropological coordinates: *astronomic* (spatial-temporal), *physical* (energy-information), *biological* (homeostasis-variability) and *psychological* (unconscious-conscious) was used to analyze and point out the presence of certain fundamental and secondary *natural interdependence relations* of the adaptive evolutive processes of S-W cycle –see Tables 1-4. This ordering, made with the anthropological coordinates mentioned above, leads to qualitative and, we hope, future quantitative evaluation of the elements along the matrix diagonal and of those on its both sides, of their complementarity and symmetry. We would like to lay emphasis on the fact that the matrix elements are characteristics-effects of life and of S-W cycle as a consequence of multiple cause interactions in the fundamental contexts Earth-Moon-Sun-Cosmos. We will further single out only a few of the important categories of fundamental natural causes, from the star level to the nanometric and Quantum levels. Their effects are present at *various structure levels of the of the human S-W vital cycle: from the organization level of the whole organism to systems of organs and to nanometric and Quantum structure of the brain*.

- S-W cyclicity is an *energetic-informational* multi-cycle with psychoinformational metabolism, multicausally interdependent on the terrestrial-cosmic context: material, formal, efficient and final, selected in anthropogenesis by the fundamental physical factors and by the fundamental adaptive evolutive processes : *cyclicity, metabolism, efficient adaptation and informational variability*, Tables 1 and 2 in restricted, dominant form and Tables 3 and 4 in a detailed form. Matricially ordered variability of the effects is due to the resultant of the action of the four natural fundamental physical fields whose effects are the four main humanizing characteristics : *verticalization, lateralization, encephalization and conscientization*, diagonals of Tables 1 and 3. They are to be found in S-W cycle in different spatial positioning of the body: horizontal in S state and vertical in W state, in the differentiated specific metabolism for the two states, in sensory adaptation, also different, and in the way information and communication is made with the external and internal medium, respectively unconscious and conscious, different and specific, complementary of the two states S-W, diagonals of Tables 2 and 4.

- S-W cycle is a *unitary couple, indivisible, unconscious-conscious which defines human life itself, with variable cyclicity and a fundamental diurnal cyclicity*. It is a switch between *two* fundamental complementary states, S state and W state, which, in their turn are characterized by *two different complementary forms of consciousness*: S state with a *state of hereditary gained unconscious state*, phylogenetic, and W state with *individual consciousness*, ontogenetically evolving. The S-W cycle may be described within the fundamental anthropological coordinates mentioned above.

- In NONREM-REM cyclicity of S state certain particular functions of S state with REM are pointed out. It is an *interface of archetypal symbolic, personalized communication* between S state and W state having certain common characteristics and *specific knowledge functions unconsciousness-consciousness and sociocultural individualization* based on personal life experience gained in ontogenesis (matricial elements II/2, III/3 and IV/4 Table 2).

- The methodology *we applied using anthropological coordinates: astronomic, physical, biological, psychologic* may also be applied in many other fields of scientific research in order to *systematize hypercomplex interdependences in our existence*, between fundamental causes and simultaneous effects resulting from adding the respective causes and effects. Many times the natural interdependence cause-effect is not correctly perceived. In all these natural states *there are general conservation and equilibrium laws that must be observed*. Otherwise the effects that are due to disregarding universal (Aristotle's) causalities will result in inevitable consequences.

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