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On the psychology of primary and secondary consciousness: Part 2

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Abstract

In this second paper on the psychology of endogenous primary and exogenous secondary consciousness, the differential natures and functions of each of these two levels of consciousness previously examined by Montare (1996, 2000, 2019) were further elaborated. Primary consciousness and secondary consciousness were further examined in this paper as naturally-emergent, psychological-level systems that arise within the hierarchical, metatheoretical cosmological evolutionary framework of five fundamental entities and their interactions: energy (Stage 1); energy-by-matter (Stage 2); energy-by-matter-by-life (Stage 3); energy-by-matter-by-life-by-mind (Stage 4); and, energy-by-matter-by-life-by-mind-by-culture (Stage 5). In this scenario, primary consciousness evolved at Stage 4 and secondary consciousness subsequently emerged at Stage 5. It was suggested that primary consciousness initially arises internally within the individual mind from neuron-to-neuron communications, whereas secondary consciousness initially arises from external, cultural brain-to-brain communications. In conclusion, Summary Table 5 shows an accumulation of 41 distinctions between primary and secondary consciousness drawn from Part 1 (Montare (2019) combined with the work of the present paper (Part 2).

Keywords: cosmic evolution; cosmological psychology;: endogenous primary consciousness; exogenous secondary consciousness; metatheoretical framework for consciousness, neuron-to-neuron communication; brain-to-brain communication.

On the psychology of primary and secondary consciousness: Part 2

Introduction to Part 2

This is the second of a planned series of papers that will attempt to further elaborate an objective and comprehensive, third-person metatheoretical approach to the study of the fundamental principles underlying the psychological natures and functions of endogenous primary consciousness and exogenous secondary consciousness.

To this end, the present paper has been organized into the following sections as further elaborations of the work presented in Part 1 (Montare, 2019):

The organization of Part 1 in this series (Montare, 2019) was based on an attempt to present the heuristic value of my version of a cosmological psychology as a metatheoretical, third-person approach to the examination of primary and secondary consciousness.

The essence of my cosmological psychology described in Figure 1 and in Table 1 below is that there are four fundamental transition points that occurred in cosmic evolution: 1) the transition from the pure primordial energy that constituted the Big Bang to the energy-by-matter interaction that formed the basis of the physical level of organization; 2) the transition from the energy-by-matter interaction to the energy-by-matter-by-life interaction that formed the basis of the physiological level of organization; 3) the transition from the energy-by-matter-by-life interaction to the energy-by-matter-by-life-by-mind interaction that formed the basis of the psychological level of organization; and, 4) the transition from the energy-by-matter-by-life-by-mind interaction to the energy-by-matter-by-life-by-mind-by-culture interaction that formed the basis of the sociological level of organization.

In this scenario, a total-unified human consciousness emerged within the human mind as a part of cosmic evolution that was composed of two parts: an ancient endogenous primary consciousness that evolved at the psychological

level of organization, and then a subsequent exogenous secondary consciousness that evolved at the sociological level of organization.

Endogenous primary consciousness was defined as a state of awareness, acquired by experience, of being with primary-knowledge-originating-within-the-body that resulted from "*...the direct, moment-to-moment interactions and raw personal sensory and sensory-perceptual experiences that the individual animal or human organism has with the objective, surrounding natural world of physical-object reality*." (Montare, 2019, p. 6). It was suggested in Montare (2019) that the physiological basis of primary consciousness arises from the ensembles and cell assemblies of interacting neurons.

Whereas, exogenous secondary consciousness was defined as a state of awareness, acquired by learning, of being with secondary-knowledge-originating-outside-the-body that resulted from "*…the initial, unintentional observational learning of the young child prior to the acquisition of full speech and language competence; and the later direct, intentional social learning achieved by the child following conscious instruction by conspecifics*." (Montare, 2019, p. 6). It was suggested in Montare (2019) that the physiological basis of secondary consciousness arises from culturally-interacting ensembles of human brains.

It was also suggested that primary and secondary consciousness arise within the mind that is itself, in turn, part of a metatheoretical cosmological framework composed of the hierarchical cosmic evolutionary progression of interactions of the five fundamental entities of: 1) energy, 2) matter, 3) life, 4) mind, and 5) culture--- that generate the four transition points mentioned above. (see Figure 1, p. 7; and Table 1, p. 11 below)

A basic idea underlying cosmological psychology is that any given psychological event is composed of a hierarchical progression of these five fundaments of the cosmos and so, in the future, when appropriate measurements of these fundaments may be achieved, a complete explanation of any given psychological event, will necessitate a non-zero value of these cosmic interactions at each of the five stages of our proposed levels of cosmic evolution.

Metatheoretical Cosmological Frameworks

In a magisterial, succinct summary of the fundamental events that comprise the evolution of the cosmos from the creation of the universe until the present time, the cosmologist Maffei (1989) produced a paragraph which encompasses the cosmological evolutionary progression inherent in the standard Big Bang cosmological model of the origin and subsequent evolution

of the universe by noting a hierarchical, metatheoretical progression from *energy* to *matter* to *life* to *thought*. Maffei stated that:

> *From **energy** came particles, from particles came atoms, from atoms came simple molecules and then more complex molecules, while the whole was condensing into immense clouds that generated a myriad of stars and an even greater number of cold solid bodies, where the evolution of **matter** progressed to the first cells, blossoming into **life**. Life then continued to evolve into more and more complex forms under the influence of the environment, which, in turn, was increasingly modified by living beings. Plants and animals developed richer and richer structures until one of them acquired **thought**. As we have seen it is through thought that the universe has become aware of itself.* (Maffei, 1989, p.369)

It may be argued that Maffei's statement merely attempts an outline of cosmic evolution. However, in this work I take Maffei's statement to be a progression set forth in terms of fundamental entities as a cosmic evolutionary framework from: energy-to-matter-to-life-to-thought.

The metatheoretical cosmological framework originally developed by Montare (2000; 2019), to be shown as both Figure 1, and as Table1below, also adopted *energy*, *matter* and *life* as the first three fundamental entities of the cosmic framework.

In addition to *energy*, *matter* and *life* proposed above by Maffei, our proposal adopts the concept of "*mind*" as a broader psychological term than "*thought*". We chose the term "*mind*" because in our work we axiomatically accepted the idea that in the human mind there exist levels of primary and secondary consciousness of sensation, perception, emotion, motivation, cognition, and the process of individuation called personality (see Montare, 2019). As noted above, our scenario also proposes the idea of a total-unified human consciousness that is itself composed of two components: endogenous primary consciousness and exogenous secondary consciousness.

And, as also noted above, our cosmological psychology extends Maffei's list of four fundaments to include a fifth fundament of nature: the sociological-level concept of human culture as the fifth fundamental entity of the cosmos.

Perhaps the most important difference between our current scenario and the work of Maffei is that in the metatheoretical cosmological framework herein being proposed, the fundamental entities are explicitly taken to exist as

accumulating interactions (as shown in both Figure 1 and in Table 1 below) that together make up the five stages of cosmic evolution.

It has been 32 years now since the publication of the cosmic framework written by Maffei in 1989, and so a more recent framework provided by the cosmologist Mack (2020) is of interest. In the following framework, based more explicitly on current views and an increase in physical observational data, Mack also addressed the scope of cosmic evolution when she wrote that:

> *About 13.8 billion years ago, the universe went from a state of unimaginable density, to an all-encompassing fireball, to a cooling humming fluid of matter and energy, which laid down the seeds for the stars and galaxies we see around us today. Planets formed, galaxies collided, light filled the cosmos. A rocky planet orbiting an ordinary star near the edge of a spiral galaxy developed: life, computers, political science and spindly bipedal mammals who read physics books for fun.*
> (Mack, 2020, p.2)

The future light cone of the universe

Figure 1 is an idealized illustration of the future light cone generated by the universe that shows the occurrence of the Big Bang as a point event at the beginning of spacetime. The idea of a future light cone has been herein adopted (and then adapted) from the realms of physics and special relativity theory as a Minkowski spacetime diagram (Minkowski, 1908) to illustrate an idealized view of our four-dimensional universe. Figure 1 was drawn by the collapse of the 3 space dimensions down to 2 horizontal space-dimensions and one vertical time-dimension (see Penrose, (2005), pp. 401-442). In this way, the sphere that resulted from the expanding universe following the Big bang can be depicted as a cone of light on the two dimensional page.

Montare (2000) initially developed the idealized future light cone labelled as **Figure 1- The metatheoretical framework** on page 7 to describe our metatheoretical cosmological framework.

The most salient metatheoretical assumption underlying Figure 1 is that the universe may be ideally depicted with the moment of the Big Bang as the event that occurred at the beginning of spacetime that then expanded outwards and upwards as cosmic evolution unfolded over a temporal interval that may be as long as 13.85 billion years.

Cosmic evolution is shown in Figure 1 as the assumption that fundamental entities of the universe beginning with pure energy interacted with each other in an accumulative, hierarchical fashion as universal spacetime expanded.

It should be noted that Figure 1 is a diagrammatic representation of the contents of the universe and that are also shown in Table 1 below.

Figure 1 – The metatheroetical framework

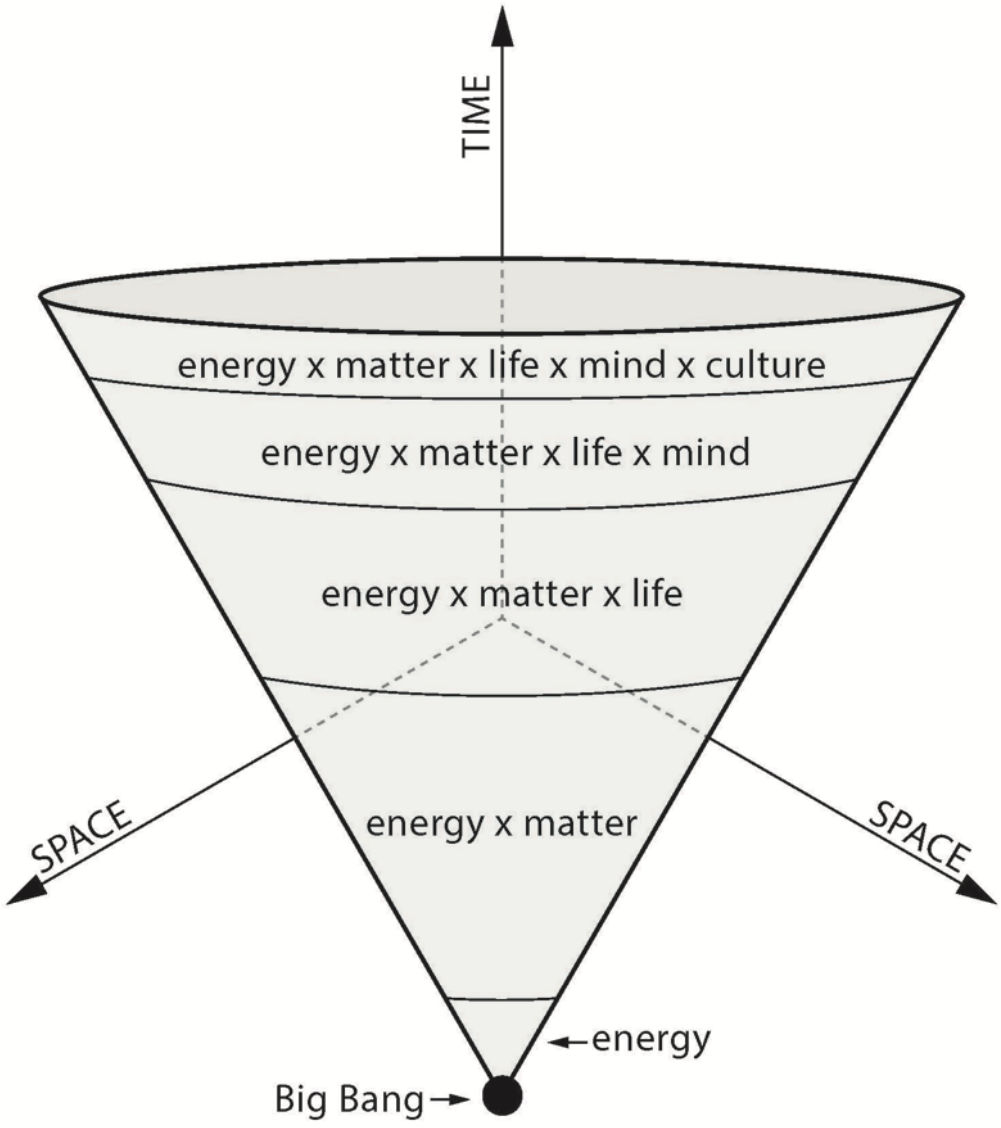

Figure 1 - The Metatheoretical Framework

Figure 1 shows the presumed light cone of the whole cosmos that started with the Big Bang that is estimated to now be 13.85 billion years old in the vertical spacetime-plane (ordinate = t) and upwardly continues from the point of creation with the currently expanding observable physical universe that is estimated to now have, after expansion, and cosmic evolution, a radius of 46.5 billion light-years in the upper-most horizontal spacetime-plane (abscissa = x,y,z).

In the metatheoretical framework shown above as Figure 1, the interactions (except the first primordial one of pure energy) are multiplicative. In this scenario, should any term within any given interaction fall to an essentially zero value, then the value of the entire interaction for that event falls to zero.

In this metatheoretical framework it is taken for granted that all life exists as a part of the unbroken chain of animate existence that is reflected in its multiplicative interactions and that has been continuously in effect since the beginning of biological life on our planet some 3.85 billion years ago.

Obviously, should the life term in any interaction term within any individual living human organism fall to zero, the chain of existence breaks for that organism, individual life terminates, and the survival of that living human organism as a sentient being with both primary and secondary consciousness ends.

It should be noted that, in the history of psychology, Hull's ambitious attempt to present a systematic behavior theory was based upon his use of multiplicative relationships such as the formula for a reaction potential to respond at any given moment in time:

reaction potential = (habit strength) x (drive) x (stimulus intensity) x (incentive motivation) (Hull, 1952, p. 7).

One implication of multiplicative interactions is that a full and ultimate explanation of any given psychological behavior and/or any given mental event in the future will only be possible when the physical, physiological, psychological and sociological nonzero values for these behaviors and/or mental events are taken into account. In order to begin to attempt to meet this goal of studying this universe-mind-body relationship, an attempt at a proposed cosmopsychological analysis of behavior is planned for future work.

Figure 1 was produced on the hopeful assumption that (based on energy-by-matter-by-life-by-mind-by-culture interactions) sentient life-forms, intelligent primary and secondary conscious minds and organized, collective cultures have evolved, are evolving, and will evolve in perhaps as many as billions of cognocosms (to be defined below) that have emerged in places

wherein local environments interacted with living organisms to produce total –unified consciousness as manifestations of cosmic evolution

Using the same criteria for producing such Minkowski-type spacetime diagrams as are currently employed by physicists (See Hawking, 1988, p. 26-27; Mack, 2020, p. 20; Penrose, 2005, pp. 401-442), Figure 1 was produced by collapsing the 3 spatial dimensions (x, y, and z) into one horizontal 2-dimensional space-plane and displaying the time dimension in the vertical time-plane (t). In this way, it is possible to attempt to diagram the four most commonly accepted dimensions of the physical universe within the 2-dimensions of the printed page.

If one restores the collapsed three spatial dimensions in Figure 1, and rotates the figure about the vertex, then one will generate a four-dimensional sphere where one can locate any point on the surface by use of the three spatial coordinates (x, y, and z) and measure its expanding motion from the moment of the Big Bang through the time dimension (t).

It may be argued that any light cone of the whole universe is logically impossible to represent in any diagram because any observer outside the light cone can not exist. All entities must, by definition, exist within the universe, and hence, within the light cone that shows the entire universe. One answer to this apparent paradox is that all illustrations of the entire universe are idealizations and not literal physical reality because there can be no external entities of the universe. Walker (2008), commenting about any illustration of the entire universe, tells us: *Don't take the illustration literally---there is **no** such "external view" of the universe because there is **no** exterior to the universe."* (Walker, 2008, p. 1240).

As noted above, the cosmological framework that forms the core of the cosmological psychology to be shown in Table 1 below, proposes that there are a series of cumulative fundamental interactions at each of the five stages of cosmic evolution and a series of four transition points between the five stages.

In Part 1 of this series of papers (Montare, 2019) it was noted that whereas many writers will not explicitly differentiate between total-unified consciousness and mind, our approach begins with the acknowledgement that within the discipline of psychology, as the study of mind and behavior, total consciousness may be taken to be only a part of the larger entity of mind.

The view of mind as a composite system having a long history in psychology was noted in Part 1 of this series of papers as follows:

> *Another reason that total consciousness is not identical to mind is the historical fact noted by Hilgard (1980) that, as late*

> *as the 18th Century, the tripartite theory of mind held that the human mind was composed of cognition, affection (emotion) and conation (motivation).*
>
> *This explicit whole-to-part distinction between mind and its components is accompanied in our approach by the adoption of the objective perspective that will most often assume an external, third-person point of view to study the natures and functions of primary and secondary consciousness of the observable human organism within the psychological-level Stimulus-Organism-Response (S-O-R) formulation.*
>
> *Therefore, we propose primary and secondary consciousness to be two major nested levels of the composite psychological system of total consciousness within the cognition component of the human mind. However, it must be noted that no account of either primary or secondary consciousness will provide full understanding without taking emotional and motivational aspects into consideration.* (Montare, 2019, p. 15)

Therefore, cosmological psychology in the present work represents an ongoing attempt to study primary and secondary consciousness in terms of a proposed cosmological progression of cumulative fundamental interactions as shown in Table 1 below (adapted from Montare, 2019, p.16).

The metatheoretical cosmological framework shown as Table 1 initially should be read bottom-up to emphasize the theoretical assumption that the fundamental interactions evolved from the single primordial entity of pure energy of the dense cosmic fireball at Stage 1; with the addition of a new single fundamental entity at each new interaction at each new stage from Stages 2 to 5.

Table 1 shows five stages of cosmic evolution; five levels of organization of the cosmos and five levels of the fundamental interactions that have been chosen to lay out my version of a cosmological psychology:

[Table 1 on next page]

Table 1 – Metatheoretical framework for a cosmological psychology

Stage of Evolution	Level of organization	Fundamental interaction
5. Sociogenesis	Sociological	energy/matter/life/mind/culture
4. Psychogenesis	Psychological	energy/matter/life/mind
3. Biogenesis	Physiological	energy/matter/life
2. Baryogenesis	Physical	energy/matter
1. Cosmogenesis	Primordial Big Bang	energy

Montare (2000) described the scenario incorporated into Table 1 as follows:

In Table 1 the emergence of mind is taken to be an integral part of the cosmological evolutionary progression set into motion some 13.8 billion years ago when our universe probably began in an incredibly hot and unimaginably dense point-event of pure, primordial energy [Stage I = primordial organization]. Energy somehow rather quickly expanded and cooled down enough for matter to exist and thereby formed the multiplicative energy-by-matter interaction that continues to constitute the physical foundation of our present-day universe [Stage II = physical organization]. Some 3.8 billion years ago the energy-by-matter interaction somehow created the life forms that have continuously existed on our planet from almost as soon as it cooled from the original heat of its creation [Stage III = physiological organization]. Some several million years ago, energy, matter and life combined to produce the energy-by-matter-by-life-by-mind interaction that very soon set down the antecedent conditions for the emergence of the primary/individual/ inherited mind [Stage IV = psychological organization]. And finally, some tens of thousands of years ago, the social networks produced by the cumulative interactions of individual human minds created our human cultures which today serve as the foundations for the developmental emergence in our young of learned acquisitions which constitute the secondary/collective/acquired mind that over time transform neonatal homo sapiens into socialized adults [Stage V = sociological organization]. (Montare, 2000, p. 4)

In the above scenario, primary consciousness arises within the primary/individual/inherited mind and secondary consciousness arises as part of the secondary/collective/acquired mind.

This metatheoretical framework is ***hierarchical*** in the sense that pure energy is taken to be the indispensable fundament of all subsequent physical, physiological, psychological and sociological entities in our cosmos. This fundamental prerequisite for energy is assumed to be, in our cosmological psychology, the necessary foundation upon which all else is built. Thus, energy is assumed to form the beginning of the natural hierarchy of increasing complexity that culminates on our planet with human culture. Given the idea that energy must exist within all physical entities, whether of ordinary matter, of enormous mass, or of massless particles; it does not seem to be so strange that physicists tell us that: "Today , dark energy makes up around 70% of the universe, while matter is around 30% and radiation is a tiny amount" (Mack, 2020, p. 97). So, it appears that energy is the most abundant entity in our universe. Therefore, in the future, any ultimately complete understanding of any given psychological event must take energy requirements into account.

This metatheoretical framework is ***evolutionary*** in the sense that cosmic evolution is adopted as the essential agent of change from energy to culture. The term ***evolutionary*** is herein used to refer to the concept that each of the five fundaments is an agent of cosmic evolutionary change that is associated with one of the basic, hierarchically related sciences. Table 1 was constructed under the postulates that: 1) energy is the fundament that underlies the science of cosmology; 2) the energy-by-matter interaction is the fundament that underlies the science of physics (which incorporates chemistry) ; 3) the energy-by-matter-by-life interaction is the fundament that underlies the science of biology; 4) the energy-by-matter-by-life-by-mind interaction is the fundament that underlies the science of psychology; and 5) the energy-by-matter-by-life-by-mind-by-culture interaction is the fundament that underlies the science of sociology. (A more detailed discourse on the relationship between the basic sciences and our cosmological framework is presented beginning on page 26 below.)

In this scenario, primary consciousness is assumed to have evolved with four major inputs from entities at the cosmological, the physical, the biological, and the psychological levels of organization. And secondary consciousness is assumed to have evolved with five major inputs from entities at the cosmological, the physical, the biological, the psychological and the sociological levels of organization.

In terms of the stage-theory of the metatheoretical framework, primary consciousness is theorized to be initially generated in a bottom-up, inductive

fashion at Stage 4 (the psychological level) from antecedents endogenously incorporated from Stages 1, 2 and 3. Whereas secondary consciousness is theorized to be initially generated in two ways: first in a bottom-up way from Stages 1, 2, and 3, (because secondary consciousness is theorized to be essentially an extension of Stage 4) and then in a top-down, deductive fashion at Stage 4 (the psychological level) from antecedents mostly exogenously incorporated from Stage 5 (the sociological level). Thus, it may be concluded that endogenous primary consciousness forms by bottom-up processing; whereas exogenous secondary consciousness forms mostly by top-down processing after Stage 5 is initially formed by bottom-up processing among socially-interacting conspecifics.

In the first paper of this series (Montare, 2019) empiricism and rationalism were invoked to call attention to the fact that the metatheoretical framework shown as Table 1 can be approached in either a bottom-up empiricist fashion or in a top-down rationalist fashion. It was concluded that:

> *The present paper contains two assumptions about the role played by empiricism and rationalism at the levels of primary and secondary consciousness. The first is that an emphasis upon a data-driven, bottom-up, inductive empiricism may prove to be the most productive approach to a more complete understanding of primary consciousness. The second is that an emphasis upon a theory-based, top-down, deductive rationalism may prove to be the most productive approach to a more complete understanding of secondary consciousness.* (Montare, 2019, p. 14-15)

The metatheoretical framework is a ***progression*** in the sense that there is an increase in complexity as one moves through a series of five cumulative, hierarchical, fundamental interactions from energy to matter to life to mind to culture.

And the relationships between these five fundamental entities are taken to be the products of ***interactions*** in the sense that---unlike one-way, cause-and-effect determinations--- these fundamental interactions are cumulative, two-way relationships that remain dependent upon the integrity of their underlying constituents as complexity increases when one ascends the stages of cosmic evolution in a bottom-up fashion.

Thus, in the present work hierarchical interactions are theorized to be consonant with the view expressed by Sperry (1983) when he wrote that:

> *When trying to visualize mental properties as they have been described, it is important to keep in mind the fact that all of the simpler, more primitive, electric, atomic, molecular, cellular, and physiological forces remain present, of course, and they all continue to operate. None has been cancelled, but these lower level forces and properties have been superseded, encompassed, as it were, by those forces of successively higher organizational entities. We must remember in particular that, for the transmission of nerve impulses, all of the usual electrical, chemical and physiological laws still apply at the level of the cell, the fiber, and the synaptic junction. We must remember further that the proper function in the uppermost level always depends on normal operation at subsidiary levels.* (Sperry, 1983, p.35)

A physical universe and a conceptual cosmos

The metatheoretical cosmological framework that was developed by Montare (1996, 2000, 2019) on the natures of primary and secondary consciousness incorporated underlying definitions of the universe and of the cosmos.

According to Merriam-Webster (1986) whereas ***universe*** is defined as "…the whole body of things and phenomena; the totality of material entities…", ***cosmos*** is defined as "…the universe conceived as an orderly and harmonious system---contrasted with chaos."

It is clear from these two definitions that the term *universe* is associated with the material entities that can be, in principle, measured to provide observational data; in contrast, the term *cosmos* is associated with theoretical notions and conceptions. Thus, the term *universe* may be be associated with an empirical orientation and the term *cosmos* may be associated with a more theoretical, rational viewpoint.

These two definitions of English-language usage of these fundamental concepts place the cosmos and the universe in a hierarchical semantic relationship because the metaconcept of 'cosmos' incorporates within it the concept of the physical, material universe plus the concept of order plus the concept of harmony. Thus, the essence of this distinction, as derived from the Merriam-Webster definitions, is that the term *cosmos* is a metatheoretical notion that incorporates the concept of *universe,* so that*:*

the conceptual cosmos = the physical universe + order + harmony.

Within the present work the additional concepts of stability and lawfulness, following Ferris (1997), will be added so that the four fundamental cosmological principles shall be taken as: order, harmony, stability and lawfulness.

Therefore, the term cosmos can be used in accordance with the following ontological definitions of first principles from the field of cosmology:

1) the orderly cosmos is defined as having a discernible organization;

2) the harmonious cosmos is defined as having a concordance of the elements that comprise the whole;

3) the stable cosmos is defined as having an enduring maintenance of equilibrium; and,

4) the lawful cosmos is defined as having laws that may be stated as formulations and/or generalizations made from observed regularities in nature that, so far as is known, are invariable under any given conditions.

Thus, the metatheoretical formula for the conceptual cosmos now becomes:

cosmos = physical universe + order + harmony + stability + lawfulness.

One may think of the cosmos (a Greek word) as a predominantly rationalistic/idealistic concept that comes to us from the theoretically-minded ancient Greeks with their emphasis on philosophy and early science; and the term universe (a Latin word) as a predominantly empirical/realistic concept that comes to us from the practical, technologically-minded ancient Romans with their emphasis upon power politics, administrative law and the civil engineering of infrastructures.

If one accepts the operational definition of the science of physics as the study of the interactions of energy and matter, then the concept of the physical universe can be alternatively defined as the totality of all of the space, time, energy and matter that there is—a totality which has at least four dimensions (three of space and one of time). Indeed, some theoretical physicists now tell us that the early universe may have had 11 dimensions that are now discernable as only the four familiar relativistic, interdependent spacetime dimensions of height, width, depth and time (x, y, z and t).

Given our present knowledge, the observable physical universe seems to extend (as it expands) in space to a diameter of at least 96 billion light-years and to have existed in time for a period of 13.85 billion light-years. These considerations have been incorporated into our adaptation of the Minkowski-type spacetime diagram that was presented as Figure 1 on page 7 above.

If the universe is all that there is, all that exists (and all that was, or ever will be); then the universe is the ultimate "whole". This means that one should keep in mind the part/whole Gestalt-type relationship between the parts of the universe and the whole universe and apply the Gestalt idea that the whole of the universe is greater than the sum of its parts. The theoretical scope of this ultimate universe (which contains the human mind and its consciousness as one of its fundamental parts) extends from the probability of an infinite regress of microcosmic physical reality of the very small that is primarily governed by quantum processes to the probability of an infinite progress of macroscopic physical reality of the very large that is primarily governed by gravitational processes and the Einstein principles of relativity.

Thus, in accordance with the above distinctions, throughout the present treatise the physical universe will be taken to be all of the energy and matter that ever was, is, or is yet to be, that contains the four dimensions of height, width, depth and time; and the conceptual cosmos will be taken to be the physical universe with the added principles of order, harmony, stability, and lawfulness.

Modern evolutionary cosmology

Since the days of Aristotle and throughout most of Western intellectual history, the dominant worldview of the knowable universe was that humans were privileged to sit atop the *scala naturae* as we occupied the terrestrial *center* of an eternal, static and fixed physical universe composed of solid, crystalline spheres (Aristotle, Ross translation,1928). From the days of ancient Greece until the second half of the 20th Century this dominant worldview of the physical universe precluded any need for a theory of cosmological evolution, because the universe was assumed to already be in a state of created perfection. A perfect universe was seen to be fully determined and fixed so that evolution was simply neither necessary or even possible.

All celestial bodies in the Aristotlean/Ptolemaic geocentric universe were assumed to be embedded within the firmament of perfect celestial spheres and so moved across the sky in **perfect** great circles within their celestial orbits. Even after the later Copernican revolution had established the reality of heliocentricism whereby the sun and not the Earth is at the center of our solar system, there was no felt need for cosmic evolutionary processes because the planets were now seen to move in **perfect** ellipses that expressed Kepler's law of the conservation of angular momentum whereby planetary bodies sweep out equal orbital areas during equal periods of time. There simply was no need to postulate evolutionary changes in what was conceived to be an already

perfect, physical universe that was eternal, static and fixed with either the Earth, or the Sun, as the central, focal point of universal creation.

Present-day modern cosmological evolutionary theory, based in large measure upon astronomical observations of the expansion of the universe summarized as Hubble's Law (Hubble, 1929) and the empirical findings of cosmic background microwave radiations believed to be the residuals of the creation of the universe (Barrow, 1994; Penzias & Wilson, 1965); now holds that the evolving physical universe, contrary to centuries of Aristotlean/Ptolemaic geocentric cosmology; is probably **not eternal**, has never been either **static** or **fixed**, and, we do not occupy the center of the universe because it ***has no center*****.**

At the core of modern cosmological evolutionary theory is the present-day standard cosmological model which holds that the evolution of the universe began with a 'Big Bang' at a finite time in the past; and, that for some 13.85 billion years now, the physical universe has been, and is: **evolving, expanding, dynamic, homogeneous and isotropic** (Ferris, 1997; Greene, 1999; Silk, 2001).

Modern cosmological theory lays out a vast evolutionary panorama wherein, over a period that may be as long as 13.85 billion years, galaxy-superclusters, galaxy clusters, individual galaxies, star systems, individual stars, planets and other astrophysical objects, live out their time in billions of years and then die; leaving behind evolutionarily-formed units of residual energy and matter to be later incorporated into new celestial entities (Ferris, 1997 ; Hawking, 1996; Kutter, 1989; Layzer, 1990; Sagan, 1980). It was the finding that the carbon atoms that lie at the core of all terrestrial life were previously synthesized in extinct stars that prompted Sagan's (1980) famous statement to the effect that "We are all made of starstuff". Thus, modern biological evolution can now be subsumed to be a local terrestrial manifestation of the larger process of cosmological evolution.

Indeed, it is possible that we may well exist in the only biologically productive era in the evolution of the universe because some cosmic evolutionists now state that the primordial universe was too hot and too dense to sustain life and, in the distant future, the vastly expanded universe may well become too cold and too low in density to sustain life (Krauss & Starkman, 1999).

Modern cosmological theory, based in large measure upon Einsteinian *macrocosmic* theories of special and general relativity that transformed our Newtonian notions of space, time, motion and gravity; combined with the development of quantum mechanics that describe the behaviors of subatomic wave/particles on *microcosmic* scales of Planck time and Plank length; is

apparently drawing nearer to a unified synthesis of the macrocosmic with the microcosmic. Indeed, some physicists are starting to talk about the proximity of the development a "theory of everything" (Greene, 1999) and are having "dreams of a final theory" (Weinberg, 1992) which would explain all cosmic and local scientific phenomena in one overwhelming unification of theory that some are calling "quantum cosmology" (Gell-Mann, 1994).

Modern cosmological evolutionary theory may well be in the nascent stages of the reorganization that must necessarily follow the incorporation into cosmology of dramatic new findings from recent biological science.

Modern biological evolutionary theory is being revolutionized by the discovery that DNA not only represents the chemical structure of molecules that are responsible for the inheritance of physical characteristics; but that DNA from moment-to-moment controls the myriad processes throughout the entire life-span whereby the "...individual cells in all organisms survive from millisecond to millisecond in the manner in which natural selection has shaped them." (Maddox, 1999, p.65).

Modern biological evolutionary theory is most probably in the process of also being revolutionized by the recent microbiological findings of "extremophiles" (Madigan & Marr, 1997) and "nanobacteria" (Taylor, 1999)--two developments which will most likely have a profound impact upon what is meant by life itself. Indeed, biologists who are finding living microbial creatures miles down into the Earth's rock-solid mantle are beginning to tell us that it is possible that there may well be more biomass under the Earth--than on its surface!!

Finding such diversity and possible abundance of extreme life forms on Earth may well portend the finding of differential life forms elsewhere in the cosmos. Findings of ice and carbon molecules in comets and other celestial objects (such as the moons of Jupiter) may well come to support the current thesis that cosmic microbial life-forms may have been the seeds of life on Earth!! Indeed, it is now possible to begin to examine the biological thesis that life may well have been both created anew on Earth as well as also seeded from the cosmos on Earth!! Thus, biogenesis may well prove out to be a robust reality that contains both terrestrial and extra-terrestrial origins.

Cosmological evolutionary theory may well need revision if it turns out that biogenesis is not merely a unique accident in one unremarkable solar system within one galaxy amongst the billions and billions of galaxies; but instead, a rather ubiquitous fundamental reality throughout the whole evolving cosmos.

Against this most exciting panorama of profound changes in the way we look at the evolution and the very nature of the cosmos and its life forms and

thereby how we look at ourselves, it is the quest of the present work to propose our cosmological psychology as a framework for the study of the nature and structure of the human mind and its primary and secondary consciousness.

Section 2 - Genesis

Stage 1 – Cosmogenesis: primordial energy

The first column in Table 1 on page 11 above shows the five stages of cosmological evolution beginning at bottom with Stage 1. Human speculation about the nature of the cosmos has a long history stretching back to antiquity.

Throughout the ages all human societies, in one way or another, have engaged in the continuous, collective, intellectual human endeavor to discover the true and ultimate origin and nature of the cosmos. From the elaboration of ancient religious creation myths to the present-day scientific standard cosmological model of the entire cosmos (now known as the Big Bang hypothesis which postulates the origin of energy, matter, and spacetime), it seems that all human cultures have attempted to gain some sense of closure (whether mythological or logical) about the origin and nature of the cosmos in which we all live.

Ancient cultures developed creation mythologies that were socially accepted as the unexamined, received declarations of supernatural divine creators that, as spiritualistic doctrinal ideas (mythos) taught as truth, were not to be criticized or questioned. In contrast, modern technological cultures have replaced ancient, unexamined, cosmological speculations with tentative, testable hypotheses that are to be critically examined and tested by the scientific method (logos) in the hopes of thereby achieving true and ultimate knowledge about the fundaments of the cosmos.

As noted in the opening paragraphs of this paper, the fundaments of our part of the observable cosmos have been taken in the present work to be a nested hierarchical progression of the entities of: energy, matter, life, mind and culture.

There has always been much debate about exactly what the fundamental entities of the cosmos are. I have chosen energy, matter, life, mind and culture because each of these terms forms the basis of a progressive level of organization and a point of transition (as discussed above on page 3) so that their interactions can be assumed to form the basis of five broad stages of cosmic evolution.

Although most ancient and primitive cultures failed to develop naturalistic views of the fundaments of the cosmos without reference to the supernatural, the early Greek cosmological philosophers laid the historical groundwork for the modern science of physics by putting forth naturalistic notions that the *arche* (the fundamental entity or ultimate underlying substance from which all else was made and from which all else was thought to be derived) was either air, earth, fire, water, the apeiron (the eternal, boundless, or infinite) or some combination of these elements.

The modern equivalent of these ancient Greek cosmological speculations about natural reality is the current proposed hypothesis that, what may be called the ‘arche’ as the ultimate substance of physical reality, may consist of one-dimensional "strings" of pure energy (Greene, 1999; Hawking, 1988; Penrose, 2005; Steinhardt & Turok, 2007). Pure energy is thus the entity that may be taken to be the currently proposed candidate as the primordial fundament of all things. Pure energy has also been theorized to be the primordial entity within the widely accepted standard cosmological model for the origin and evolution of the universe because, before the formation of matter, the Big Bang apparently consisted of the genesis of energy, time, and space (with time and space combined in modern physics into the concept of spacetime). In this scenario, ordinary matter was formed when the pure energy released by the Big Bang at an enormously high temperature cooled down enough for matter to exist and subsequently interact with energy to form the energy-by-matter interaction. Thus, in the energy-by-matter physical interaction, matter has been called “frozen energy”.

Although the modern standard cosmological model of the universe has recently moved from informed speculation about cosmological reality into the realm of empirically observed scientific facts, it should be noted that within modern physics a final definition and delineation of the true and ultimate nature of all of the energy and matter that comprises the physical universe has yet to be achieved. Indeed, one of the problems with modern string theory at the microcosmic end of the cosmos is that these proposed physical entities may be so extremely small that they may be, in principle, forever unobservable by any newly developed modern microscopic precision measuring instruments and thus may forever remain within the realm of theory without the support of empirical observational data.

At the macrocosmic end of the universe, the totality of space and time may be so enormously large that, in principle, the entire physical universe must forever remain directly unobservable because by the time any photons of light reach us from the deep cosmic edges, if the expanding universe is travelling faster than the speed of light, then the light from those distant cosmic entities

will never reach us, and thus remain forever unknown to us or interact with our part of the observable cosmos in any meaningful manner.

Closer to home, since the light from our Sun takes about 8 minutes to reach us, we always see our star as it was 8 minutes ago. These facts about the nature of astronomical observations seem very far removed from the concerns of psychological theory until one recognizes that distal stimulations (photons from deep space and deep time) can have profound impacts on our conscious and emotional responses to the world. One consequence of these modern facts about time and space is that we must remain aware of the fact that because knowledge of celestial objects must take either billions of years or minutes of travel-time before reaching us, we can never see the whole cosmic world as it **is**, but rather as it **was**.

In any case, the quest for the ultimate nature of physical reality is now being called by physicists the "theory of everything" or more commonly the "theory of quantum gravity" because such a theory would unify the four fundamental forces of nature (the electromagnetic force, the weak nuclear force, the strong nuclear force and the force of gravity) and provide explanations for events that occur in the microcosm and in the macrocosm.

Although the field of cosmology, through the advancement of technological observational tools, has recently moved from informed speculation into the realm of empirically observed facts; it may still be said that an ultimate definition and delineation of the primal genesis of the universe has yet to be achieved.

The concept of ‘pure energy’ in the present work shall be assumed to be the most fundamental entity of all physical concepts. It shall be assumed in the present work that: 1) it all started with pure energy; 2) that all extant physical material entities must contain some quantity of some form of energy; and that, 3) no ultimate, complete understanding of any physical entity will be possible until a full understanding of exactly **how** quantities of potential and/or kinetic energies become transformed into the capacity to do various forms of work.

In these terms, one of the most basic questions of modern psychology is an aspect of the ancient mind-body, specifically, it can be asked: How does the physiological energy doing physiological work within the human brain become transformed into the psychological energy doing psychological work within the primary and secondary consciousness of the human mind?

For twenty years now, I have been searching the scientific literatures for a theoretical definition of energy and it seems that the available definitions of energy are operational definitions that tell you about the capacity of energy to do various forms of work such as chemical work, electrical work, mechanical

work, nuclear work, etc., without attempting to define exactly what energy is. In the history of science, a comparable situation occurred when Newton set forth in mathematical terms the operational definitions for the laws of gravity and simultaneously steadfastly refused to speculate about the ultimate theoretical nature of gravity. So, the present situation seems to be such that we know what energy **does**, but not what energy **is**.

In an example of how the law of the conservation of energy always gives the same answer of the total amount of energy within any given physical system (in his example, say "28" units of energy), Feynman (1963) stated that:

> *It is important to realize that in physics today, we have no knowledge of what energy **is**. We do have a picture that energy comes in little blobs of a definite amount. It is not that way. However, there are formulas for calculating some numerical quantity, and when we add it all together it gives "28"---always the same number. It is an abstract thing in that it does not tell us the mechanism or the **reasons*** for *the various formulas. (Feynman, et al, 1963)*

Based upon these considerations, at the present time it may be stated that an ultimate theoretical definition of the physics of energy and, thus, of microcosmic and macrocosmic cosmogenesis, has yet to be set forth or achieved. Therefore, the ultimate nature and origins of the energy contained in the cosmos have yet to be delineated.

Stage 2 - Baryogenesis: the energy-by-matter interaction

It shall be assumed in the present work, along with what appears to be the consensus among theoretical physicists, that the earliest universe at the moment of the Big Bang did not contain normal matter and that as the early universe expanded and cooled enough for matter to exist as frozen energy, the energy-by-matter interaction that forms the basis of all ordinary, normal matter beyond pure energy was created.

Physicists refer to normal matter in the following way:

> *Normal matter (such as stars, planets, dust, and molecules) is often called **baryonic matter** because its mass is primarily due to the combined mass of the protons and neutrons (baryons) it contains. (The mass of the electrons is neglected because the mass of an electron is so small relative to the mass of a proton or neutron.*) (Walker, J. 2008, p. 1239)

Thus, the term ‘baryogenesis’ was chosen in the present work to describe the origin of the normal matter of the universe because the most stable building blocks of the universe are taken by particle physicists to be the baryons; and the greatest amount of mass in the atom is provided by the proton and the neutron which are baryons. The other particle constituent of the atom is the electron which is a lepton. Therefore, the term baryogenesis refers to the fact that most of the mass of ordinary atomic matter was created when the relatively stable atomic nucleus was created from two particles: the proton and the neutron.

Although a lot of progress has been made, it may still be said that an ultimate definition and delineation of the physics of ***baryogenesis*** and the subsequent fundamental reality of the energy-by-matter interaction has yet to achieved.

Stage 3 - Biogensis: the energy-by-matter-by-life interaction

Throughout the ages thoughtful individuals have also speculated about the true and ultimate nature of the biological processes that make up the physiology of living, behaving organisms. From antiquity to modern times, the origin, development, structure, function, reproduction and evolution of living organisms have been studied by many diverse thinkers, using many diverse methods that have led to many diverse attempts to define and delineate life.

Among the many theoretically-based lines of inquiry into the nature of living organisms, the most successful has been the modern biological synthesis of the Darwinian evolutionary theory of natural selection combined with the more recently observed empirical facts of the DNA/RNA molecular basis of both initial genetic inheritance and the subsequent continuous online epigenetic initiation and control of ongoing biological processes.

Notwithstanding the success of the modern biological synthesis to explain many diverse empirical facts of biology such as the current quest to understand and control both embryonic and adult stem cells that may possess the "pluripotentiality" to truly become the "mothers of all cells"; it may still be said that within modern biology the ultimate definition and delineation of ***biogenesis*** as the origin and ultimate nature of life has yet to be achieved.

Stage 4 - Psychogenesis: the energy-by-matter-by-life-mind interaction

Throughout the ages thoughtful individuals have also engaged in the continuous intellectual human endeavor to discover the true and ultimate nature of the human mind and its consciousness. From the mythologically-based speculations of antiquity to the empirically-based scientific disciplines of modern times--- the philosophy of mind and consciousness; the physics of mind and consciousness; the physiology of mind and consciousness; the psychology of mind and consciousness; and, the sociology of mind and consciousness have been considered by many diverse scholars.

Among the many lines of inquiry into the nature of mind and consciousness, the age-old mind-body problem has examined the mind in its relationship to the body in which it is found. Given that the biological body is the ultimate source of all human and animal behavioral actions and mental processes, it has been said that all psychology, as the science of behavioral and mental events, at its most fundamental level addresses some aspect of the ancient mind-body problem. Although there have been many diverse attempts to understand and explain mind and its consciousness; it should be noted that within the discipline of modern psychology a universally acceptable definition and delineation of the concept of mind and its consciousness still remains a largely unattained goal.

The robust quest for the neural correlates of mind and its consciousness within modern cognitive neuroscience represents the modern form of the ancient quest to understand, predict and control the relationship between the abstract mind and the concrete body.

Indeed, as noted above, even today the essential mind-body problem still requires a definitive answer to the question of how the neuro-electrical energy of the living human brain can become transformed and transcended into the mental energy of the human mind. How does the material, physiological brain generate the immaterial, psychological mind?

A fundamental principle of the present work is that human primary consciousness endogenously generated *within* the human brain is a part of the body-to-mind problem that is a bottom-up processing phenomenon; whereas, human secondary consciousness exogenously generated *between* human brains prior to stimulating individuals is a part of the mind-to-body problem that is a top-down control phenomenon.

And so, it may still be said that an ultimate definition and delineation of ***psychogenesis*** and the subsequent psychology of mind with its consciousness, has yet to achieved.

Stage 5 - Sociogenesis: the energy-by-matter-by-life-by-mind-by-culture interaction

Throughout the ages thoughtful individuals have also considered the origin and ultimate nature of the human collectivities that are referred to as societies and/or cultures. Given the many processes that go into molding human neonates into fully socialized members of all particular cultures, it is possible to define the overall process of human socialization/enculturation as the social process whereby any given culture attempts to assure that its young will indeed acquire those characteristics that are valued by that particular culture. Given the biological fact of human neoteny (delayed biological development at birth such that independent survival is impossible for many years after birth), then one can see that all human babies must be kept alive by the social caretakers who assure their survival. Therefore, all normal adult *homo sapiens* are truly socialized animals because the interaction of biological human neoteny with human social enculturation is a most powerful combination which assures that external and internalized cultural expectations of individual human behaviors, values and attitudes continuously function as basic psychological-level motivating factors throughout the entire human lifespan. Although there have been many diverse attempts to explain the true and ultimate nature of society and culture (and especially the influence of culture upon the behavior of individual humans), it should be noted that within modern sociology a universally acceptable definition and delineation of the true and ultimate nature of culture and society has yet to be attained.

One of the most fundamental questions at the sociological level of organization is the part/whole relationship between the single individual and the entire social group. In the analysis of any given social event—how much of the outcome is due to endogenous contributions of the individual mediated at the level of primary consciousness and how much is due to the exogenous contributions of the whole group that is the basis of secondary consciousness?

Although there have been many diverse attempts to explain the true and ultimate nature of society and its material culture (and especially the influence of culture upon the behavior of individual humans), it should be noted that within modern sociology a universally acceptable definition and delineation of **sociogenesis** and of the true origin and ultimate nature of culture and society has yet to be attained.

Section 3– Sub-levels of organization

Sub-levels of organization in the physical universe

Figure 1 (on page 7 above) and Table 1 (on page 11 above) were constructed with the underlying principle that the orderly cosmos has a discernible organization that underlies our attempt to show a metatheoretical framework for the fundamental interactions of cosmic evolution composed of the progression from energy to matter to life to mind to culture. Given that Figure 1 and Table 1 deal with the proposed broadest fundaments of the cosmos, there is a need to begin to develop some appreciation of a more detailed look at the sub-levels of organization of the fundamental interactions.

Table 2 has been developed with the idea of attempting to display in one table some of the sub-levels of organization of the physical universe as a hierarchical continuum from the microcosmic physical reality of the very small to the macrocosmic physical reality of the very large. It should be noted that Table 2 (like Table 1) begins at bottom with sub-level 1.

Table 2 is an attempt to place on one page a hierarchical sampling of: three worlds, ten sciences, nineteen estimates of space (as size), twenty sub-levels of organization, and twenty examples of entities at each sub-level.

[Table 2 on next page]

Table 2 – Sub-Levels of organization in the physical universe

W	Science	Size(m)	Sub-Level of organization	Example
		$10^{??}$	20. Macro-uncertainty	??Multiverse??
		$10^{??}$	19. Known Universe	Universe
M				
A		10^{25}	18. Galaxy Superclusters/ Walls	Virgo
C				
R	Cosmology	10^{21}	17. Galaxy	Milky Way
O				
C	Astronomy	10^{13}	16. Solar System	Sun/planets
O				
S	Geology	10^{7}	15. Ecosphere	Planet Earth
M				
	Ecology	10^{6}	14. Ecosystem	Forest System
C	Sociology	10^{6}	13. Population	Mankind
O				
G	Psychology	10^{0}	12. Organism	Human
N				
O		10^{-1}	11. Organ System	CNS
C				
O	Physiology	10^{-1}	10. Organ	Brain
S				
M		10^{-1}	9. Tissue	Cortex
		10^{-5}	8. Cell	Neuron
	Biology	10^{-6}	7. Organelle	Mitochondria
		10^{-9}	6. Molecule	Water/DNA
M				
I	Chemistry	10^{-10}	5. Atom	Hydrogen
C				
R		10^{-14}	4. Atomic nucleus	Proton
O				
C		10^{-16}	3. Elementary particle	Quark
O				
S		$10^{-33cm.}$	2. Theoretical string	String ?
M				
	Physics	10^{-43cm}	1. Micro-uncertainty	?? < Planck length, time> ??

Table 2 displays five columns. The first column shows the three worlds that may be discerned wherein one may define: 1) the microcosm as the world

of the very small that descends to micro-uncertainty, the microcosm is the world that is so small that it can not be overtly observed without instruments such as microscopes or particle accelerators; 2) the "cognocosm" as the world of the physical realities within the ranges of our sensory systems that may be consciously sensed by humans without the aid of instruments such as microscopes or telescopes; and, 3) the macrocosm as the world of the very large that may not be veridically observed by humans without instruments and which requires telescopes to begin to ascend to macro-uncertainty.

The term cognocosm was chosen as an attempt to use a term that strongly implies the existence of consciousness in this middle world because our sensory and perceptual systems allow us to directly know of, and be aware of, the contents of this world and to consciously respond to them. Thus, the world of which we are, or can be, **cognizant** by use of our natural sensory systems has formed the basis for calling this middle world the cognocosm. We are at all times under the influence of both the microcosm and the macrocosm, but our sensory and perceptual systems, without either microscopes or telescopes, do not provide us with discernible stimulations from these worlds that can form the basis of effective supra-threshold levels of awareness in primary consciousness.

The second column of Table 2 shows some of the basic sciences that begin their study of physical reality at each of the indicated hierarchical levels organization. It should be recalled that the section on science and our cosmic framework on pages 26 to 31 above discusses the relationship between the basic sciences and the various levels of our cosmological framework.

Historically it should be noted that, as early as 1842, Comte rank-ordered the sciences from: 1) mathematics, to 2) astronomy, to 3) physics, to 4) chemistry, to 5) biology, then to 6) sociology, as part of his attempt to present the basic foundations for a "Positive Philosophy" (Comte, 1842). He noted that the relationship was hierarchical and that as one went from astronomy to sociology there was an increase in complexity of phenomena required to gain knowledge at each new level.

The third column of Table 2 shows some of the sizes of things in the physical universe. It was compiled from the work of Arcand & Watzke (2017), Morrison, et al (1994), Scharf (2017) and tHooft & VanDoren, 2014). In powers of ten meters (except for the two lowest levels that are shown in centimeters), the table shows the progression in size from the infinitely small microcosmic uncertainty to the infinitely large macrocosmic uncertainty.

The fourth column of Table 2 contains some of the sub-levels of organization that make up some of the order that can be found in the physical universe. At the present time, our knowledge of the physical universe extends

from the possibility of fundamental, one-dimensional strings as the smallest entities of our universe to the possibility of multiverses of which our universe may be only a small part of some sort of population of many universes (the multiverse). Smolin (1997) has presented a theory that each of the many millions of black holes in our universe may become a separate universe each of which becomes a part of the whole multiverse.

The fifth column of Table 2 shows examples of concrete objects at each level of organization. This last column contains both known and theoretical objects such as strings and multiverses. The Planck values at the bottom of the table are the estimated values of measurements of space and time for the smallest length, and smallest time interval. They are both approximations as follows: Planck length $\cong 10^{-33}$ centimeters; Planck time $\cong 10^{-43}$ seconds.

Inherent to Table 2 is the thesis of the present work that primary consciousness is found in humans and animals and evolves mostly by Darwinian natural selection in what has been called the grand synthesis of modern knowledge of DNA/RNA molecular biology with the older work on the origin of species. It should be noted that Darwin (1859) spoke at length about the domestication of animals by the process of artificial selection by domestic breeders. The aim of domestication was to improve the breeds by careful selection by breeders of desired traits that could be brought forward in succeeding generations of animals under the complete control of humans.

The aim of cultural selection by human conspecifics may be seen as the attempt by every culture to assure that their young will indeed acquire those characteristics and desired traits that are valued by any given culture.

Cultural selection produces secondary consciousness in normal human children and, as mentioned above, is carried forward by the processes of enculturation and socialization. Socialization contains at least two levels of learning: 1) the learning of manual, sensory, perceptual, and motor skills (‘hands-on learning’) at the level of primary consciousness so that the young can do concrete things of social value; and, the learning of cultural values, language and other higher-order abstractions in secondary consciousness so that the young can begin to think abstract thoughts of lifetime social value that guide action and reaction.

Section 4 - Science and the Cosmological Framework

As was noted above, each stage of our cosmological evolutionary metatheoretical framework is associated with one of the basic sciences. The following five sub-sections further elaborate these relationships.

Stage 1 and the science of cosmology

The science of cosmology has been defined by Harrison (2000) in the following way:

> *Cosmology, the science of the universe, attracts and fascinates us all. In one sense, it is the science of the large-scale structure of the universe: the realm of extra-galactic nebulae, of distant and receding horizons, and of the dynamic curvature of cosmic space and time. In another sense, it seeks to assemble all knowledge into a unifying cosmic picture. Most sciences tear things apart into smaller and smaller constituents in order to examine the world in ever greater detail, whereas cosmology is the one science that puts the pieces together into a "mighty frame".* (Harrison, 2000, p. ix)

My earlier attempt (Montare, 2000) to put the cosmic pieces together into one "mighty frame", the metatheoretical framework shown in Table 1 on page 11 above was originally introduced with the following words:

> *Cosmologists tell us that the cosmic clock started some 13.8 billion years ago when an unimaginably powerful primordial singularity of pure energy exploded into the hot Big Bang that created our known physical universe (Hawking, 1988). Cosmologists also tell us that Earth was created some 4.6 billion years ago as the third planet of an apparently unremarkable solar system whose central star is but one of some 150 billion other stars in our 100,000 light-year-wide Milky Way galaxy. The cosmogenetic proposition put forth by physicists that our universe began with the creation of space, time and energy as an exploding point-event has been adopted as the basis for our Stage 1 of cosmic evolution. Simply put: Stage 1 is based upon the Big Bang model's assumption that cosmic evolution began with pure, primordial energy.* (Montare, 2000, p. 1)

Stage 2 and the science of physics

Physicists tell us that:

> *"Physics, the oldest and most basic of the sciences, is the science of matter and energy and of the relations between them. The domain of physics includes matter in all its forms---solids, liquids, gases, plasmas, molecules, atoms, and the particles out of which atoms are made. It also includes energy in all its forms---mechanical, electromagnetic, nuclear, thermal, and radiant energy. Physicists attempt to understand these different kinds of matter and energy that constitute the universe"*. (Mulligan, 1991, p. 1)

In our framework, Stage 2 of cosmic evolution is based upon the idea posed by physicists that, at the most fundamental level measured as mass, the physical universe is composed of energy-by-matter interactions.

The relationship between energy and matter is given by perhaps the most famous formula in the world originally developed by Einstein: $e = mc^2$. It is this relationship that forms the basis for Stage 2 as shown in Table 1 on page 11 above. It may be seen from the Einstein formula that energy and matter are interchangeable; so that matter has been called "frozen energy" and so enormous amounts of stored energy can be released from matter in nuclear reactions. Indeed, physicists tell us that "…mass can be considered to be another form of energy…" (Walker, 2008).

The work on the cosmic microwave background radiation apparently supports the conclusion that a direct, extant 'fossilized" record of the Big Bang is the cosmic microwave background radiation energy that was found throughout the sky by Penzias and Wilson (1965) that was originally billions of degrees hot but is now cooled down to only about 2.7 degrees Kelvin above absolute zero.

Thus, all physical, material, substances in our universe apparently are, at bottom, examples of the energy-by-matter multiplicative interaction that we have adopted as the basis of our Stage 2 of cosmic evolution.

Stage 3 and the science of biology

Biologists tell us that hierarchically-organized life has continuously existed on our planet for some 3.85 billion years. Biologists also tell us that all life displays eight shared and fundamental characteristics: a precise organization, metabolism, homeostasis, movement, responsiveness, growth, reproduction and adaptation (see Villee, Solomon, & Davis, 1985, p. 1). Addressing themselves to the field of biology as "...the science of life...",

Wessells and Hopson (1988) based the organization of their textbook "...on the levels of organization within a living entity and its environment"... and asked the following question:

> *"What exactly is life? One way to answer this question is to construct a list of characteristics that put some boundaries around this elusive concept we call life. Living things have a complex organization. Living things take in and use energy. Living things grow and develop. Living things reproduce. Living things show variations based on heredity. Living things are adapted to their environments and ways of life. Living things are responsive".* (Wessells & Hopson, 1988, p. 3)

The above statement that *"Living things have a complex organization"* is congruent with our metatheoretical approach shown in Table 1 on page 11 wherein the second column shows the levels of organization underlying the psychological reality of the human mind that contains its two levels of primary and secondary consciousness.

And the above statement that *"Living things take in and use energy"* is herein taken to be congruent with our axiomatic acceptance of the idea that all things (living or not) must at bottom contain some amount of underlying energy as shown in Table 1.

The importance of the overarching organizing principle of the concept of evolution in the study of life was stated in these words:

> *"One other very special feature of living organisms is their history. Every living thing on Earth today is a descendant of an organism that lived before it. Each is a member of an unbroken lineage stretching backward in time to the era, billions of years ago, when life processes became associated with organized sets of matter. Thus, a knowledge of evolutionary history is important to our understanding of many characteristics of present-day organisms". (*Wessells & Hopson, 1988, p. 7*)*

It should be noted that in my cosmic framework, biological evolution is acknowledged to be only one part of the overall cosmic evolutionary history of the universe. The difference between biological and cosmic evolution was summarized in the following way:

> ***If,*** *one of the fundamental insights of the 19th Century was the thesis that groups of living organisms differentially evolve over periods of millions of years by the mechanism of biological natural selection so that descendants come to differ morphologically and physiologically into separately organized new species (Darwin, 1859/2003; deDuve, 1995);* ***then****, perhaps one of the fundamental insights of the latter part of the 20th Century will prove to be the thesis that biological evolution on Earth is but a local part of a universe-wide cosmological evolution whereby groups of astrophysical objects differentially evolve over periods of billions of years by a mechanism of cosmological natural selection so that astrophysical descendants come to differ morphologically and chemically into separately organized new forms of asteroids, comets, planets, stars, galaxies, galaxy-clusters, and galaxy-superclusters; and at the centers of galaxies black holes that consume objects as big as stars (see Hawking, 1988; Kutter, 1989; Smolin, 1997).* (Montare, 2000, p.4)

If life generated by biological evolution here on Earth is part of the overall process of cosmic evolution, then life may well be generated on other parts of the cosmos by cosmic evolution when the conditions are appropriate. The active search for extraterrestrial life (SETI) mentioned above is a continuous effort to provide supporting data for this quest.

Based on these assumptions about the fundamental nature of life on our planet, our model of cosmic evolution posits a Stage 3 based upon the energy-by-matter-by-life multiplicative interaction.

Stage 4 and the science of psychology

Psychologists tell us that: "*Psychology can be defined as the scientific study of behavior and mental processes"* (Atkinson, et al., 2000). The fundamental processes of study in the field of psychology include: sensation, perception, emotion, motivation, cognition (consciousness, memory, learning, problem-solving, etc.) and individuation/personality.

In Montare (2019) I set forth the thesis that if our framework is to have heuristic value, then one should be able to distinguish primary sensation from secondary sensation, primary perception from secondary perception, primary emotion from secondary emotion, primary motivation from secondary motivation, primary cognition from secondary cognition and primary aspects of personality from secondary aspects of personality (see Montare, 2019 for

details of a first attempt at some of these distinctions).

At the level of psychological organization, the ancient mind-body problem poses the still unanswered question of how the physiological neural activity of the brain produces the psychological mental activity of the mind, its mental consciousness and its behavioral responses?

As noted above, Stage 4 of our model of cosmic evolution is based upon the idea of an energy-by-matter-by-life-by-mind multiplicative interaction.

Stage 5 and the science of sociology

Sociologists tell us that: "*Sociology is the scientific study of human behavior in groups and of the social forces that influence that behavior"* (Doob, 1991, p. 4). Among the still unanswered questions of sociology is the question of how individual humans come together to collectively produce the complex social behaviors and value systems of human cultures? Another question is the relative amount of influence that individual social forces as opposed to group social forces play in the outcome of social behaviors?

Our work emphasizes the idea that it is through the processes of enculturation and of socialization that every human culture attempts to assure that its young will indeed acquire the positive behavioral characteristics that are valued by each individual culture. In our work we place enculturation and socialization at the core of our concerns with Stage 5.

Socialization may be defined as:

> *socialization = the process by which individuals acquire social skills, beliefs, values, and behaviors necessary to function effectively in society, or in a particular group. (APA Dictionary, 2015, p. 997)*

Enculturation may be defined as:

> *enculturation = the processes beginning in early childhood, by which particular cultural values, ideas, beliefs, and behavioral patterns are instilled in the members of a society (APA Dictionary, 2015, p. 368)*

It should be noted that the two definitions describe human social/cultural learning from the point of view of who the actors are: socialization (wherein the actors are individuals) describes the acquisition of social skills, beliefs, values, and behaviors with emphasis on the endogenous activities of individuals-within-groups; and enculturation (wherein the actors are groups) describes the attainment of cultural values, ideas, beliefs and behavioral patterns with emphasis on the exogenous activities of groups–upon-

individuals. In terms of individual-versus-group differences, socialization is a bottom-up process that focuses on the individual's acquisition of skills, beliefs, values and behaviors that operate in the group and that are necessary for effective individual functioning in society. Whereas, enculturation is a top-down process initiated by the group on the individual to produce valued members of the group who share cultural values, ideas, beliefs, and behavioral patterns.

Thus, it may be suggested that socialization affects primary consciousness as an endogenous process; whereas, enculturation affects secondary consciousness as an exogenous influence.

Therefore, although the contents of what is learned may be the same, it may be proposed that socialization is a learning process acquired by individual experiences within primary consciousness; whereas, enculturation is a learning process that is instilled in individuals at the level of secondary consciousness.

Thus socialization may be seen to be an individual process acquired by individuals at our Stage 4; whereas, enculturation may be seen to be a group process that originates at our Stage 5.

Section 5- Time and consciousness

As part of his book dealing with *The Psychology of Time*, Paul Fraisse wrote:

> *Through the centuries man has striven to master the fundamental conditions of his existence. Periodic changes ---day and night, the lunar cycle, the annual recurrence of the seasons --- have provided at the same time, natural frames of reference against which to locate other changes and a means of measurement. Starting from an increasingly abstract notion of time, philosophers have reflected on its nature. The history of time is inseparable from the history of human thought.* (Fraisse, 1963, p.2)

The main goal of this section shall be to examine primary and secondary consciousness as forms of temporal behavior in humans.

Primary consciousness may be seen to be a mental system that predominantly processes events that take place in the temporal present by the employment of sensory and perceptual systems. It is also proposed that within

memory systems linked to primary consciousness the contents of concrete sensory past events are stored and subsequently made available to awareness within primary consciousness.

Secondary consciousness may be seen to be a mental system that also predominantly processes events that occur in the temporal present and that also is influenced by memory systems. However, secondary consciousness is, in addition, influenced by projected future events that are yet to occur by the employment of the abstractions created by the employment of cognitive systems that make up the human imagination. So, it is proposed that primary consciousness processes concrete past and present events; and that secondary consciousness processes past and present events as well as the processing of projected future events as abstractions of the human mind.

In terms of the contents of Table 3 below, primary consciousness operates at Stage 4 with inputs from Stages 1 to 4. Secondary consciousness operates at Stage 4 with inputs form Stages 1 to 5.

Montare (1971) concluded that: if time is defined as the passage of observable and measurable periodic events, then "…only through the passage of measurable events does real time exist." (Montare, 1971, p. 32). This definition of time as the passage of measurable periodic events gives a physical definition to time which is in keeping with the use of time as the fourth dimension in Figure 1 as shown on page 6 above.

In Montare (1971) measurable periodic events were attributed to systems existing on three different levels of organization: physical systems, physiological systems and psychological systems. Later on, Montare (1996, 2000) added primordial time at the bottom of this temporal sequence; and, subsequently added sociological time at the top, so that, at present, a different temporal system is proposed at each of the five stages of cosmic evolution that are shown in the metatheroretical framework of Table 1 on page 11 above.

These five stages of time are shown in Table 3.

Table 3– Five stages of time

Temporal system	Observable and measurable events
Stage 5 - Sociological time	Cultural periodic events
Stage 4 - Psychological time	Psychological periodic events
Stage 3 - Physiological time	Biological periodic events
Stage 2 - Physical time	Physical periodic events
Stage 1 - Primordial time	Big Bang event (a singularity)

Table 3 begins at bottom with Stage 1 of cosmic evolution when the primordial events of the Big Bang set into motion the subsequent series of events whose remains are at present discernible in the cosmic microwave background radiation (Harrison, 2000). The Big Bang event started the cosmic clock originally composed of primordial pure energy that has been running now for about 13.8 billion years.

In Montare (1971) I described a nested hierarchy of time based upon physical time (now Stage 2 in Table 3) as the foundation for all subsequent temporal frames of reference in the following words:

> *Three kinds of time may be distinguished: a) physical time, b) physiological time, and, c) psychological time. Physical time is the passage (and subsequent recording) of real, physical events within the physical universe. Clocks—either mechanical, electro-mechanical, electronic and even atomic clocks—measure real time as the passage and recording of physical events. Physical time encompasses the entire spectrum of matter, from sub-atomic particles to macroscopic universes. Physical time is not an independent entity. Physical time is a fundamental property of matter which owes its existence to those characteristics of matter which come to manifest themselves as measurable physical events. This analysis therefore demands the view that if there are no events, there is no real physical time.* (Montare, 1971, p.32)

The analysis of physiological time (now Stage 3 in Table 3) was presented in these words:

> *Physiological time may be defined as that portion of the physical passage of events which is limited to living, organized systems. Physiological time—i.e., the internal passage of events occurring within a living organism— may or may not correspond to the set of physical events by which we measure external, physical time. During the same physical time period a young organism and an old organism will respectively display widely differing rates of those basic physiological processes which we collectively refer to as "growth" in the former and "aging" in the latter.* (Montare, 1971, P.33)

The analysis of psychological time (now Stage 4 in Table 3) was presented in these words:

> *Psychological time may be defined as that portion of physiological time within the human brain which has somehow transcended matter and become a part of the consciousness of human beings. Obviously, psychological time as such an excellent example of the ancient mind-body problem, has historically been the source of much confusion concerning the nature of time. Physical time and physiological time depend, for their very existence, upon the passage of physical and physiological events. Psychological time, because it has become part of the human consciousness can be abstractly conceived of as existing independently of events. Only the human mind can conjecture upon an endless time—without reference to beginning, and even without reference to reality as we know it. Only the human mind can reflect upon the past, observe the present and contemplate the future—not only its own, but the temporal perspectives of other organisms.* (Montare, 1971, p. 33-34)

Later on, Montare (1996, 2000) added sociological time to the above nested temporal hierarchy proposed earlier in Montare (1971). Sociological time was defined as that portion of psychological time which represents the passage of social-cultural events. Although Fraisse (1963) did not explicitly distinguish between different levels of time, the following statement leaves no doubt that he was nonetheless providing a precursor to what is herein referred to as sociological time when he wrote that:

> *Social life is the background par excellence of our adaptation to change; it refracts, as it were, the transformations of the world around us. Is it not true that bringing up children consists essentially in teaching them to adapt the cycle of their activities and desires to the rhythms of adults? It is the parents first who fix the time of getting up, going to bed, meals, playtime, and work. Later school, a job, the town add their own demands. It is through living with others that we suffer from postponements forced on the fulfillments of our desires. Those two forms of adaptation, expectation, and the precipitation of an action, are aggravated and increased in number by our social life. When we submit to time it means for all practical purposes that we accept the time of others.* (Fraisse, 1963, p. 288).

It should be noted that the relationships between the five stages of time shown in Table 3 are proposed to be hierarchical in the sense that:

1. Primordial time marked the events surrounding the Big bang,
2. Primordial time formed the basis of the first interaction with physical time which emerged from the primordial events surrounding the Big bang,
3. The primordial-time-by-physical-time interaction formed the basis of physiological time,
4. The primordial–time-by-physical-time-by-physiological-time interaction formed the basis of psychological time, and,
5. The primordial-time-by-physical-time-by-physiological-time-by-psychological-time interaction formed the basis of sociological time.

The above considerations may be summarized as three conclusions as follows:

1. time may be operationally defined as the passage of measurable physical, physiological, psychological, and/or sociological periodic events;
2. a nested hierarchy containing five levels of time may be distinguished starting with the Big Bang (Stage 1) as the cosmic event that started the cosmic clock; physical time (Stage 2) as an emergent part of primordial time; physiological time (Stage 3 as an emergent part of physical time; psychological time (Stage 4) as an emergent part of physiological time; and, sociological time (Stage 5) as an emergent part of psychological time; and,
3. primary consciousness initially evolves within cosmic evolution from physical, physiological and psychological events; whereas secondary consciousness initially evolves within cosmic evolution from physical, physiological, psychological and sociological events.

Given that primary consciousness may be defined as a foundational mental system that processes the physical, physiological and psychological temporal events of the natural environment; it has been possible to suggest that human primary consciousness evolved by natural selection from the workings of the ensembles of neurons that make up the human brain. Given that secondary consciousness may be defined as a relatively higher-order mental system which operates by processing physical, physiological, psychological and sociological temporal events; it has been possible to suggest that human

secondary consciousness evolved by social selection operating upon the workings of the ensembles of brains that make up human social groups.

It should be noted that natural selection as used above refers to the basic mechanism of Darwinian evolutionary theory as it applies to the evolution of the structure and function of the ensembles of neurons that make up the human brain. It should also be noted that social selection as used above refers to that portion of natural selection that presumably operated upon already existing primary consciousness within the ensembles of brains that make up human cultural collectivities.

Just as the biological reality of genes within ensembles of neurons transmit the characteristics which form the basis for the development of primary consciousness; one may conjecture that the sociological reality of memes may help to transmit the socially-shared characteristics which form the basis for the development of secondary consciousness. Thus, primary consciousness is based upon the operation of genes; whereas secondary consciousness is based the higher-order operation of a genes-by-memes interaction.

On this view, human primary consciousness is a predominantly biologically-based psychological-level entity derived from the physical realities of organism-environment interactions; and, human secondary consciousness is a predominantly socially-based psychological-level entity derived from the physical realities of communications within human-to-human interactions that builds upon the contents of already-existing primary consciousness.

The concept of spacetime (see pages 5 to 7 above) that has been incorporated into the above working definition of human consciousness requires some clarification. Given that all physical events must occur at some point in physical time and, simultaneously, at some point in space, all events must occur in what physicists have come to call spacetime consisting of a four-dimensional matrix composed of three dimensions of space (x, y, z) and one dimension of time (t). Although there are currently string theories that propose as many as 11 hidden dimensions for our universe; the modern concept of four dimensional spacetime as an x-y-z-t matrix incorporates the requirement that space and time are not independent absolutes, but rather, that both space and time are, by the theory of relativity, dependent upon matter, energy and relative motion.

Simultaneous and successive temporal events

These considerations lead one to the idea that, at the psychological-level of organization, those series of events that contain minimal changes in the time dimension with maximal changes in the space dimensions manifest

themselves to us as simultaneous temporal events ; whereas those series of events that contain maximal changes in the time dimension with minimal changes in the space dimension manifest themselves to us as successive temporal events.

It is theorized that primary consciousness may be the predominant level of psychological organization for the information processing of the simultaneity of events; whereas, secondary consciousness may be the predominant level for the information processing of successive temporal events. What this means is that primary consciousness operates predominantly, if not exclusively, in the present in order to process the demands imposed upon the human organism by the simultaneity of naturally-occurring events; whereas, as noted above, secondary consciousness can operate by consideration of the past, contemplation of the present, and planification of the future. In more modern terms, primary consciousness controls online processing of immediate events; whereas, secondary consciousness can, in addition, control offline processing of events that may be of immediate present concern, and/or of reflection of the past, and/or of projection into the future.

Another aspect of the distinction between the processing of simultaneity and successtivity is that one may map the processing of simultaneity mainly onto the predominantly analog-processing right hemisphere with its contributions to primary consciousness; whereas, the predominantly digital-processing of successtivity may be mapped mainly onto the left hemisphere with its contributions to secondary consciousness. We shall return to this mapping in future papers of this series.

Section 6 – Towards quantitative supporting data

An organizing principle

In our cosmological psychology the hierarchical organizational principle inherent in the above quotation from Sperry (1983) on page 14 above has been herein elaborated as a principle of hierarchical organizational autonomy which holds that each succeeding cosmological evolutionary level of organization retains within it the fundaments that constitute its antecedent levels of organization, while simultaneously becoming relatively autonomous from the preceding levels of which it is composed because each new stage at each new level is also a new gestalt.

A simple illustration from the world of physical chemical interactions may be offered. When two atoms of sodium and chlorine combine to form common table salt the new molecule possesses hierarchical organizational autonomy as

a whole new entity with new properties not present in either constituent part; while still retaining its two normally operating constituent atomic parts. When table salt is formed each new salt molecule can be taken to be greater than the mere sum of sodium and chlorine atoms that make up its parts.

Another example is the idea that in a normal, fully-functioning socialized human being, total-unified consciousness is hierarchically, and organizationally relatively autonomous from the primary and secondary consciousness that make up its constituent parts. Equation 1 below is a first step in quantifying this idea as a multiplicative interaction.

The principle of hierarchical organizational autonomy is consonant with the Gestalt concerns with part-whole relationships. However, the principle of hierarchical organizational autonomy differs in that it holds that the whole, due to its organization into a new multiplicative interaction, is greater than the simple arithmetic sum of its parts. The principle of hierarchical organizational autonomy also differs from the Gestalt formulation in that it emphasizes the idea that the integrity of the whole at all times remains dependent upon the functional integrity of its constituent parts as noted by Sperry (1983).

Three metatheoretical psychological equations

As an attempt to provide some further heuristic value in the examination of consciousness as a composite psychological-level process, three new metatheoretical equations were developed as multiplicative functions for: (1) total-unified human consciousness; (2) primary consciousness; and, (3) secondary consciousness [see Montare, 2020 for further details].

The equation for total-unified human consciousness was given as follows:

$$THC_{st} = f\,[(PC)(SC)] \qquad \textit{[Equation 1]}$$

where total human consciousness (THC) at any given psychological event, within any sentient human organism, at any given coordinates of spacetime (st), is a function of the multiplicative interaction of primary consciousness (PC) with secondary consciousness (SC). (Montare, 2020, p. 5).

This equation may be taken to signify that the two components that make up total-unified consciousness are in a multiplicative relationship such that the whole entity that we now call total-unified consciousness is greater than an arithmetic sum of its principal component parts of primary and secondary consciousness.

For instance, the flick of a light switch in a totally darkened room produces two effects: 1) an endogenous sudden awareness in primary consciousness of a sensory change in luminescence (with a total reaction time of about 200 milliseconds); and 2) an exogenous subsequent awareness (about 200 milliseconds later) in secondary consciousness of a sensory-perceptual change that permits the now lighted objects in the room to be consciously identified. Thus, if one had been seeking a particular book in the darkened living room of the house, the sensory change in luminescence would be a necessary precondition for the sensory-perceptual identification of any given object in the room.

It is suggested that in this example, the first reaction in primary consciousness is the awareness of a strong sensory change in luminescence (an awareness that has antecedents stretching back to ancient, single-celled organisms) prior to any sensory-perceptual identification of objects (that has antecedents in more recently evolved organisms) in the room that occurs as a process within secondary consciousness. These two levels of awareness occur so seamlessly in sequence that the multiplicative interaction of primary and secondary consciousness are most often consciously experienced as one event. However, if the lights in the room were to fail to provide continuous illumination due to a short-circuit following the flick of the light switch, then the objects in the room would remain below the threshold level necessary for the identification of physical objects.

The equation for primary consciousness was presented as:

$$PC_{st} = f\,[(energy)(matter)(life)(mind)] \qquad [Equation\ 2]$$

where primary consciousness (PC), at any given event, at any given coordinates of spacetime (st), is a function (f) of the multiplicative interaction of the fundamental cosmological entities of: energy, matter, life, and mind. (Montare, 2020, p. 6)

This equation states that primary consciousness has four metatheoretical underlying components: energy, matter, life, and mind, so that any complete, ultimate explanation of the awareness of any given psychological event in primary consciousness must account for underlying levels of each of these four fundamental cosmological entities.

The equation for secondary consciousness (SC) was presented as:

$$SC_{st} = f\,[(energy)(matter)(life)(mind\ )(culture)] \qquad [Equation\ 3]$$

where secondary consciousness (SC), of any given event, at any given coordinates of spacetime (st), is a function (f) of the multiplicative interaction of the fundamental cosmological entities of: energy, matter, life, mind and culture. (Montare, 2020, p. 6)

This equation states that secondary consciousness is composed of five components: the four components that make up primary consciousness with the addition of the cultural component. These three equations were generated for their possible heuristic value as guides for future work on a metatheoretical level, rather than as summaries of quantitative data that has already been gathered.

The Drake and Montare equations compared

Francis Drake (Drake & Sobel, 2005) in 1961 presented a formula to a group of colleagues at the Green Bank Radio Observatory as a series of talking points to begin a discussion of the possibilities of there being intelligent life elsewhere in the cosmos. Drake summarized his thoughts as talking points for the first conference concerning what became known as SETI (search for extraterrestrial intelligent life) in what has now become known as the Drake Equation.

The Drake Equation states that:

$$N = R^* \cdot f_p \cdot n_e \cdot f_l \cdot f_i \cdot f_c \cdot L$$ where:

N = number of technologically advanced civilizations in the Milky Way galaxy.

R^* = rate of formation of stars in the galaxy

f_p = fraction of those stars with planetary systems

n_e = number of stars , per solar system, with an environment suitable for life

f_l = fraction of suitable planets on which life actually appears

f_i = fraction of life-bearing planets on which intelligent life emerges

f_c = fraction of civilizations that develop a technology that releases detectable signs of their existence into space

L = length of time such civilizations release detectable signals into space.

Table 4 – Drake Equation (1961) compared to Montare (2000) framework.

	Drake (1961)	Montare (2000)
Entities	Interactions	Interactions
civilizations [1]	$R^* \cdot f_p \cdot n_e \cdot f_l \cdot f_i \cdot f_c$	energy · matter · life · mind · culture
intelligence	$R^* \cdot f_p \cdot n_e \cdot f_l \cdot f_i$	energy · matter · life · mind
life	$R^* \cdot f_p \cdot n_e \cdot f_l$	energy · matter · life
environments	$R^* \cdot f_p \cdot n_e$	energy · matter
planets	$R^* \cdot f_p$	energy · matter
stars	R^*	energy · matter

[1] L is the length of time in the Drake Equation that the entire formula has been in place as technological civilizations send out signals into space.

The first comparison between the Montare and Drake equations is that both are speculative statements about quantities that are at present unknown that are presented for their heuristic value as guides to future quantitative work that may yield supporting data. The most salient aspect of the Drake Equation as it is shown in Table 2 is that it is a speculative scenario for the cosmic evolution of extraterrestrial civilizations that send out electromagnetic signals.

Table 2 is arranged to be read from the bottom-up with the first three rows essentially proposing that the appropriate kind of stars, planets and environments are the necessary precursors of life. The two systems may be directly compared because the Drake Equation begins on the right hand side with formation of stars (R^*), planets ($R^* \cdot f_p$) and environments ($R^* \cdot f_p \cdot n_e$) as the necessary antecedents of life ($R^* \cdot f_p \cdot n_e \cdot f_l$). Whereas the Montare scenario would account for the formation of stars, planets and environments as part of the cosmic energy-by-matter interactions.

The comparison becomes more direct when the two scenarios describe the formation of life, intelligence and culture after the formation of stars, planets and environments. First, life is formed as shown in the above paragraph. Then intelligence occurs, and finally, advanced civilizations emerge. Table 2 shows the comparisons for the origins of these three entities.

It may be recalled that primary consciousness was proposed above to be the resultant of the energy-by-matter-by-life-by-mind interaction and secondary consciousness was proposed to be the resultant of the energy-by-matter-by-life-by-mind-by-culture interaction. Perusal of the top two rows of Table 2

shows that the Drake Equation accounts for the existence of intelligence and advanced civilizations in a manner that is consonant with the formation of primary and secondary consciousness if one takes intelligence to be essentially equivalent to the conscious primary mind and an advanced civilization to be a form of the cultural secondary mind.

There has been much criticism that the Drake Equation is not a scientific equation that summarizes known empirical facts that can lead to testable and falsifiable hypotheses. In response, as mentioned above, it should be noted that both the Drake Equation and the Montare cosmological framework are attempts to speculate about the nature of the cosmos that go beyond the present-day known empirical facts in the hopes that both systems may prove to have some heuristic value.

Section 7 - Summary and conclusions

Table 5 is a summary table that combines distinctions between primary and secondary consciousness drawn from Part 1 (see Table 8, Montare, 2019) with those of this Part 2.

Table 5 is organized into three parts: 1) a set of some 22 general distinctions, 2) a set of distinctions between 6 fundamental psychological processes, and, 3) a set of some 13 basic psychological constituents.

"General distinctions" refers to a set of distinctions across many areas of psychological science in general; "fundamental psychological processes" refers to the fundaments of psychology such as: sensation, perception, motivation, emotion, cognition and personality-self-individuation. As herein adopted, the "basic constituents of psychology" are some of the content areas of psychology that may be shown to have aspects of primary and secondary consciousness.

[Table 5 on the next two pages]

Table 5 – Table 8 from Montare (2019) extended with new distinctions.

General Distinctions

Primary Consciousness	**Secondary Consciousness**
Energy/matter/life/mind interactions	Energy/matter/life/mind/culture interactions
Endogenous	Exogenous
Acquired by individual experience	Acquired by social learning
Socialization	Enculturation
Bottom-up processing	Top-down processing
Data-driven analysis	Theory-driven analysis
Inductive reasoning	Deductive reasoning
Empiricist orientation	Rationalistic orientation
Biological evolution	Cultural evolution
Natural selection	Cultural selection
Interactions with nature	Interactions with nurture
Psychological time base	Sociological time base
Past and present events	Past, present and future events
Biologically ancient system	Culturally more recent system
Animal and human consciousness	Human consciousness
Primary knowledge	Secondary knowledge
First signaling system	Second signaling system
Autocentric	Allocenrtric
Nonverbal	Verbal
Neural code	Neuro-linguistic code
Individualistic	Collective
Ideographic	Nomothetic

Table 5 - (Continued)

Fundamental Psychological Processes

Primary sensations	Secondary sensations
Primary perceptions	Secondary perceptions
Primary motivations	Secondary motivations
Primary emotions	Secondary emotions
Primary cognitions	Secondary cognitions
Primary personality/individuation	Secondary personality/individuation

Some Basic Psychological Constituents

Primary genes	Secondary genes
Primary gene/environment interactions	Secondary gene/meme/environment interactions
Primary memory	Secondary memory
Primary thought	Secondary thought
Concrete attitude	Abstract attitude
Concrete objects	Abstract words/symbols
Primary attention	Secondary attention
Primary stimulus	Secondary stimulus
Primary response	Secondary response
Primary awareness	Secondary awareness
Primary reaction	Secondary action
Primary learning	Secondary learning
Primary reaction time	Secondary reaction time
Primary vision	Secondary vision

Perhaps the most principal conclusion that may be drawn from this initial attempt to set forth a metatheory to provide some definitional and conceptual clarity regarding fundamental differences between the natures and functions of primary and secondary consciousness is that although the emphasis has been on postulations of the distinctions between them, one may conclude that both levels of consciousness contain the same fundamental elements and processes and that the salient distinctions are manifestations of primary and secondary aspects of the same elements and processes. As an example, it was proposed that the fundamental element of awareness has a primary form and a secondary form. As another example, it was also suggested that the fundamental process of sensation has a primary and a secondary manifestation.

Another metapsychological conclusion of the present work is that the nature of some distinctions is such that the differences are relative, and not absolute differences, and so are perhaps best described in terms of maxima and minima rather than all-or-none mutually exclusive dichotomies. As an example, it was proposed that human linguistic processes exist at a minimum in primary consciousness and at a maximum in secondary consciousness; rather than there being no language in primary consciousness and all language in secondary consciousness.

Perhaps the two most basic conclusions of this nascent metapsychology are that: 1) primary consciousness is a psychological-level entity containing primary knowledge that is rooted in the physiological level of organization and, 2) that secondary consciousness is a psychological entity containing secondary knowledge that is developmentally incorporated from interactions with human conspecifics as socialization takes place at the sociological level of organization.

It should be noted that the present metapsychological work is only the start of an endeavor to more fully understand how it is that primary and secondary consciousness may function so smoothly and seamlessly in the successfully socialized adult that the underlying fundamental differences are not readily apparent and so have not yet been more fully elucidated.

Finally, it is hoped that this initial attempt to elaborate a metapsychology of primary and secondary consciousness can have some heuristic value in the subsequent development of specific testable hypotheses about the natures and functions of primary and secondary consciousness.

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