

Conte's Approach to Human Cognition by Application of Quantum Mechanics: a Revisitation of the Yin-Yang Theory and Jung's Psyche Model by Using Such Quantum Approach

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ABSTRACT

According to the ancient Chinese philosophy, manifestations in our reality follow a pattern of continuous transformation between immaterial (Yang) and material (Yin), two opposed, mutually interdependent and consuming forces. This cycling and pulsating movement is not only observed in the rhythm of life, but also throughout the evolution of psyche, as Jung states. In his model, psyche is the total of all psychic processes, composed of two complementary and antithetical spheres, namely consciousness and the unconscious. Continuous transition of the raw material of the psyche, unites the opposite functions, shaping the attitude. These elaborations find confirmation on some recent advances formulated in Conte's quantum model of cognition.

Key Words: Cognition, consciousness, quantum mechanics, psyche, Yin-Yang theory

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"The yang returns cyclically to its beginning, the yin attains its maximum and gives place to the yang."
(Needham, 1981)~ Kuei Ku Tzu 400 BC

Introduction

In Taoist philosophy, Tao, the indefinable reality, is accepted to cover all forms in the universe. The ever-changing nature of Tao manifests as Yin (material) and Yang (immaterial). Yin and Yang relationship was not only a topic of interest in thought schools in China but also constituted the core of Traditional Chinese Medicine (TCM). In TCM, diagnosis and treatment are entirely

dependent on analysis and recovery of Ying-Yang balance (Maciocia, 2005).

Contemporary medicine is established on a materialistic basis. Abstract parameters like consciousness and mind, which were evaluated together with bodily functions in ancient medical practice, are not yet included in routine evaluation procedures of today's medicine. However, introduction of quantum mechanics has provided a broader and holistic perspective for the interpretation of concrete and abstract parameters and helped to improve our understanding about reality. Starting from 1983, E. Conte (Conte, 2008; 2009; 2010a; 2010b; 2010c; 2011a; 2011b; 2011c; 2012a; 2012b; Conte *et al.*, 2004; 2006a; 2006b; 2006c; 2007; 2008a; 2008b;

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2009a; 2009b; 2009c; 2010; 2012a; 2012b; 2012c; 2012d) has developed a well-established reformulation of quantum mechanics by using the Clifford algebra and a lot of theoretical and experimental confirmations were introduced by this author and his coworkers. Let us establish the basic points reached by this author:

- 1) In classical mechanics there is no room to consider mind entities. Traditional physics is based on the assumption that matter exists per se. Human beings are passive observers in the sense that they may perform experiments, may observe and quantify the matter properties by laboratory experiments, the results of which are accepted to represent the exact counterpart of matter properties existing independently of its observation.
- 2) Conte's results point out a different conclusion. Quantum mechanics is totally different from classical physics. This theory has some specific peculiarities emerging in particular when we adopt a Clifford reformulation of this theory. At this level we discover that there are stages of our reality in which we no more may separate matter from cognition that we have about it. This is a point that represents an actual advance in our basic knowledge. In addition, Conte has discovered that quantum mechanics has peculiar origins, following in this elaboration a previously approach discussed by Y.U. Orlov (Orlov, 1994), one of the most important logical thinkers of this century. He finds about the logical origins of quantum mechanics by using a Clifford algebraic approach. By using logic statements and, we repeat, following previous results obtained by Orlov, he evidences that indetermination and quantum interference may be obtained starting with such logic, basic statements. Since irreducible indetermination and quantum interference represents the peculiar nature of quantum mechanics, this author correctly concludes for the logical origins of quantum mechanics. Finally, Conte considers a quantum measurement as a semantic act and gives proof of the von Neumann basic postulates on quantum measurement (Conte, 2010a; 2010b) and wave

function collapse, giving for the first time, evidence of such basic mechanism and recovering self-consistency to quantum mechanics where in fact the standard quantum theory does not give demonstration of wave collapse but adds this mechanism to the standard axiomatic formulation with the result that the quantum wave function collapse remains a process admitted from the outside and thus missing in this case the theory of its whole and necessary self-consistency. There is still another feature to anticipate. Conte's approach pertains to applied physics. The sense of this statement is that this author applies quantum mechanics to the sphere of the perceptive and cognitive dynamics performing also, in collaboration with his coauthors, detailed experiment confirming the quantum mechanical approach (Conte *et al.*, 2004; 2006a; 2006b; 2006c; 2007; 2008a; 2008b; 2009a; 2009b; 2009c). He considers, as example, the case of Bell inequality violation as well as Jung basic model, giving also in this case experimental confirmation (Conte *et al.*, 2008a; 2008b; 2010).

In the present paper we are devoted to examine Ying-Yang Theory and Jung's psyche model attempting to evidence that in some cases profound links exist between Conte's approach and such last important elaborations.

Cognitive psychology considers the body as a system which has the capacity to process information. In Jung's model, psyche is defined in terms of conscious and unconscious components, which are further divided into four main cognitive functions, thinking, feeling, sensing and intuition. Jung's model has interesting similarities to and shares nearly all aspects of Yin-Yang theory in TCM (Jacobi, 1973). In this paper, Jung's psyche model is evaluated together with ancient Yin-Yang concept in the frame of Conte's approach to quantum mechanics.

Yin-Yang Concept & Conte's Approach

Tao is the indefinable reality which gives rise to T'ai-chi, as described in the pioneer book of Taoist thought, "The Tao Te Ching", written approximately 2500 years ago (Tzu, 1989);

The Tao begot one.



*One begot two.
 Two begot three.
 And three begot the ten thousand things.
 The ten thousand things carry yin and
 embrace yang.
 They achieve harmony by combining these
 forces.*

In these ancient verses above, *one* stands for T'ai-chi from which *two* (Yin and Yang) arouse (Yudelove, 1999). In Taoism, existence is an eternal conversion between nothingness, *wu chi*, symbolized by an empty circle and T'ai-chi (means ridgepole), which is symbolized by T'ai-chi T'u (Fig 1) and represents transformations of Yin-Yang. T'ai-chi T'u looks like a symmetrical distribution of dark Yin and bright Yang; however this distribution follows a continuous cyclic and pulsating movement, like the rhythm of life. The bright dot in the center of dark section has a symbolic meaning, indicating that when Yin reaches its maximum, the seed of the opposite (Yang) is already present, vice versa (Capra, 1982a).



Figure 1. T'ai-chi T'u symbol

Yin is material, meaning "hill shaded with a cloud", whereas Yang is immaterial and means "irradiated by the sunlight over the horizon". Although Yin and Yang symbolize two opposite cyclical stages or condensation states of matter, the mutual opposition they represent, complies with mutual complementarity. In addition to being opposite forces, Yin and Yang are mutually dependent, consuming and transformed to each other in a continuous cycle (Maciocia, 2005).

In addition to thought schools, Yin-Yang concept forms the basis of TCM. In TCM, disease patterns are recognized by Yin-Yang analysis. Internal organs mainly possess either Yin or Yang character; however each organ has both Yin and Yang characteristics, like their structures (Yin) and functions (Yang). Optimal

health is maintained by the adjustment of Yin-Yang balance, by tonifying the weak and eliminating the excess from the preponderant (Maciocia, 2005).

Conte's approach is entirely based on the use of the basic Clifford algebraic elements $e_i (i=1,2,3)$ satisfying the following two postulates:

$$e_i^2 = 1 ; e_i e_j = -e_j e_i ; i \neq j$$

The first postulate contains the basic framework of quantum mechanics.

$$e_i^2 = 1$$

It means that such abstract entity both contain the ontological, potentiality to assume the value +1 or -1. Both such potentialities coexist simultaneously in such algebraic scheme. The actual possibility to assume or the value +1 or the value -1 is only matter of probability, thus of intrinsic and irreducible indetermination.

In Chinese philosophy, the continuous changing of these opposite pools, Yin (--) and Yang (—) were accepted to represent certain processes in the nature as well as character and archetype patterns, including their tendencies for movement (Capra, 1982b). Combination of Yin and Yang in pairs, results in four patterns (Fig 2), and organizing Yin and Yang in trigrams and hexagrams yields eight and sixty four patterns, respectively. Each trigram represents a human character (Fig 3), and each hexagram stands for a cosmic archetype. In the "I Ching" the trigram and hexagram of unbroken lines (completely Yang) is the Creative (Ch'ien), "strong" and representing heaven/ father; the trigram and hexagram of broken lines (completely Yin) is the Receptive (K'un) is "yielding" representing earth / mother. The remaining six trigrams denote 3 sons (Chên, K'an, Kên) and three daughters (Sun, Li, Tui), carrying more Yin and Yang natures, respectively (Wilhelm and Baynes, 1997).

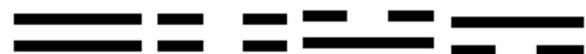


Figure 2. Yin-Yang combinations in pairs.

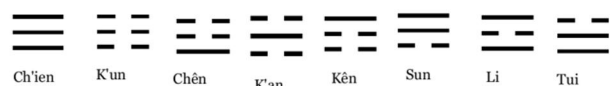


Figure 3. Yin-Yang combinations as trigrams.

This system was first described /elaborated in *I Ching* (Book of Changes), which was compiled by the Ruler of China, King Wên, in 1150 B.C. The current version contains attributed commentaries from Confucius and has been highly respected by psychologists and occultists. Richard Wilhelm, a German sinologist, translated the Chinese version into German, and introduced it to the world with the foreword of Swiss psychiatrist Carl Gustav Jung (Wilhelm and Baynes, 1997). In the foreword, Jung indicates that Chinese mind is interpreting the cosmos like a modern physicist. He says every process in the nature operates partially or totally through probabilities and that whatever happens in a given moment possesses inevitably the quality peculiar to that moment. In his opinion, *I Ching* is not based on causality but synchronicity principle. Synchronicity, the coincidence in space and time, is the outcome of subjective (psychic) state(s) of the observer(s) and consequently, hexagram of *I Ching* is an indicator of the essential situation prevailing in the moment of its origin;

“The causal point of view tells us a dramatic story about how D came into existence: it took its origin from C, which existed before D, and C in its turn had a father, B, etc. The synchronistic view on the other hand tries to produce an equally meaningful picture of coincidence. How does it happen that A', B', C', D', etc., appear all in the same moment and in the same place? It happens in the first place because the physical events A' and B' are of the same quality as the psychic events C' and D', and further because all are the exponents of one and the same momentary situation”.

Jung also wrote a foreword and a commentary as well, for Wilhelm's translation of “The Secret of the Golden Flower” (Wilhelm, 1962). This book of wisdom first published in the eighteenth century, had its origins from an esoteric circle in China. For centuries, it was transmitted orally, and later in writing. The characters in the term “golden flower” (Chin Hua in Chinese) form another character (Kuang, light) when placed one over another. The human body is under the influence of two psychic forces, animus (hun) and anima (p'o), having Yang and Yin characters, respectively. Anima is driven by worldly passions. By the circulation of light, animus is concentrated to control the anima,

hence the spirit. Following death, anima returns to the earth, while animus rises up leaving ego unattended. Jung's long commentary in the book reveals that he was quite inspired by the past treasures of Chinese mind. His theories on consciousness and collective unconsciousness reflect the harmonization of Western way of casual thinking with Eastern synchronistic thinking.

The Psyche Model of Jung

According to Jung, psyche has a broader meaning than soul and is the total of all psychic processes. It's composed of two complementary and antithetical spheres, namely consciousness and the unconscious. When the psyche is symbolized with a circle, upper and lower parts representing conscious and unconscious, respectively, ego resides at the center. Ego may be displaced in both directions, if the line separating both spheres is shifted upwards or downwards. The interference between conscious and unconscious divisions, like mutual consuming of Yin and Yang as we discussed above, may determine the preponderance of each component. Jung describes ego as the subject of the consciousness. The ego is surrounded by the consciousness field, which protects the relation of ego with personal and collective unconscious content. Consciousness has grown out of and is dependent on unconsciousness (Jacobi, 1973).

Psychic integrity represents four basic functions: Thinking, feeling, sensation and intuition. Thinking and feeling are rational functions; they are mediated by values and judgments. On the other hand, sensation and intuition are irrational functions, independent of comments and evaluations;

“Thinking evaluates through cognition from the standpoint of true-false, while feeling through the emotions from the standpoint of pleasant-unpleasant. Sensation perceives things as they are and not otherwise. Intuition also perceives but less through the conscious apparatus than through its capacity for an unconscious inner perception of the inherent potentialities of things” (Jacobi, 1973).

The conscious (superior) field covers thinking, and partly sensation and intuition, whereas the unconscious (inferior) field covers feeling, and again partly sensation and intuition. These functions are antithetical and



mutually exclusive, and cannot operate simultaneously (Jacobi, 1973).

In Jung model, the "function" should be understood not as a basic function but as a complex function made up of other functions. Similarly, "transcendent" does not denote a metaphysical quality, but in fact facilitation of a transition from one attitude to the other (Jung, 1990);

"The raw material shaped by thesis and antithesis, and in the shaping of which the opposites are united, is the living symbol".

Jung correlates his model with T'ai-chi T'u, which he thinks is the product of inner vision and one of the primordial symbols of humanity. The superior (bright, Yang) part is the conscious, while the inferior (dark, Yin) part is the unconscious. Jung reminds that the way of the movement starts from the brightest pole (The Creative, father), drawing a reversed S, passes through bright and dark regions (daughters and sons) and reaches the darkest pole (The Receptive, mother) in the unconscious (Jacobi, 1973). Jung describes the interplay of the opposites between the consciousness and the unconscious, also using the term *enantiodromia* (Jung, 1990);

"I use the term enantiodromia for the emergence of the unconscious opposite in the course of time. This characteristic phenomenon practically always occurs when an extreme, one-sided tendency dominates conscious life; in time an equally powerful counterposition is built up, which first inhibits the conscious performance and subsequently breaks through the conscious control."

There are four intermediate stages between the four main functions, called intermediate functions: empiric/sensational thinking, intuitive thinking, sensational feeling and intuitive feeling. All components of the psyche display a continuous interplay. They are mutually interdependent, consuming and transformed to each other like Yin and Yang. Pure feeling function is regarded as entirely embedded in the darkness. Inferior functions lie in the subconscious and are primitive, controlling nearly the whole behaviors. If all of these eight functions could be carried to the conscious field and cleared from the dark side, then the whole circle would be brightened, yielding the true human being (Jacobi, 1973).

When 8 trigrams are symmetrically replaced in the T'ai-chi T'u symbol, opposite

trigrams having interchangeable Yin and Yang natures, the symbol simply represents the natural order of the seasons in the clockwise order (Jacobi, 1973), as shown in Fig 4.

Jung's "complexes" are fields which have escaped from the control of the conscious, and try to exist in the dark side of psyche. Complexes, connected to archetypes, may support or block the performance of the conscious. Archetypes are limited in number and form the essential content of the unconscious. They are spiritual processes transformed into images, the ancient models of human behavior, and the portraits of intuitions (Jacobi, 1973). Similarly, the eight main trigrams and the sixty four hexagrams of *I Ching*, represent the images of all possible humanly situations, that is cosmic patterns or archetypes (Capra, 1982b).










<p>The Joyous (joyful, 3rd daughter)</p> 	<p>The Creative (strong, father, summer)</p> 	<p>The Gentle (penetrating, 1st daughter)</p> 
<p>The Clinging (light-giving, 2nd daughter, spring)</p> 		<p>The Abyssal (dangerous, 2nd son, autumn)</p> 
<p>The Arousing (inciting, 1st son)</p> 	<p>The Receptive (yielding, mother, winter)</p> 	<p>Keeping Still (resting, 3rd son)</p> 

Figure 4. The eight trigrams (symbols) as explained in I Ching.

Interpretation of Jung's Model by Conte's Approach

Quantum mechanics implies that in our reality, opposite potential alternatives co-exist, which are also superimposed and intrinsic with irreversible indeterminism. A quantum system may display two types of evolution, reversible and irreversible states. The reversible state represents the states of potentiality. The irreversible state evolves by the reduction of this potentiality through actualization, i.e., measurement of a quantum variable in this system (Conte, 2010a; 2010b; 2010c; 2011a; 2011b; 2011c; 2012a; Conte *et al.*, 2006a; 2006b; 2006c). Accordingly, thinking and feeling as well as sensing and intuition are opposite, superimposed and ontological potentials till observation. To display one of these functions resides in the field of probabilities. Following processing of



the internal and external information by the psyche, at the moment of self-observation, the probability linked to one psychological function may be favored, determining the attitude as extraversion or introversion (Conte 2008; 2010c; Conte *et al.*, 2007; 2008a; 2008b; 2009a; 2009c).

It has been shown by direct calculations that following an impulse, synapses seem to mediate neurotransmission in a probabilistic manner. When an observer decides to perform a mental action, in other words to process the incoming information via measurement, a sudden change in the probability field is induced. Mental and neural events are causatively interrelated. Neurotransmission is the result of this probabilistic change and responding to a stimulus operates via integration of quantum tunneling and neuronal networks (Conte, 2010c). In brief, the human body is a highly complex quantum mechanical entity; the matter part is coupled with mind entities. Matter does not exist independently from the cognition we have about it, as in Conte's statement (Conte *et al.*, 2012c). We retain that the coherent biophoton field could represent evidence of this probabilistic communication (Bischof 2003; 2008). Paracrystalline presynaptic grids in the synaptic cleft (Conte, 2010c) and appearance of liquid crystals in acupuncture points appearing only after appropriate stimulus (Wentao, 2001) seem to us confirming the quantum- based and coherent nature of information processing in living systems.

When two sub-entities are connected via quantum entanglement, they remain in a quantum interconnection regardless of space distance separation. These sub-entities are in a superimposition of probable opposed states till measurement is made. But once a sub-entity is measured and its state becomes definite, the state of the other also becomes certain without any need for measurement. Therefore through measurement process, the state of the entangled entity changes probabilistically and quantum collapse occurs. Bell inequality is accepted as a mean of determining quantum entanglement. Violation of Bell's inequality indicates that quantum entanglement is in process (Conte, 2010c; Conte *et al.*, 2008a; 2008b; 2009a; 2010). Conte and coauthors, following a previous formulation (Blutner and Hochnadel, 2010), showed that we have Bell

violation inequality in Jung quantum mechanics model of the personality.

If opposed functions and attitudes are quantum entangled, then by measurement, a quantum collapse is expected to occur. At the moment of measurement, the preferred functions will be plausible for that moment, shaping the attitude. Jungian model has been investigated in a quantum mechanical experimental setting. Myers-Briggs Type Indicator test was applied for personality testing. Violation of Bell inequality was used as an experimental indication to verify quantum structure. Bell's inequality was violated in at least 59 % of cases, indicating that attitudes and psychological functions are quantum entangled (Conte *et al.*, 2010). The eight transition stages (eight psychological functions of Jung) of Self were plotted in a graph (Fig. 5). As in the T'ai-chi T'u symbol, the opposed poles are placed symmetrically in this graph. The highest level of thinking corresponds to the lowest level of feeling, vice versa. Similarly, the highest level of sensing corresponds to the lowest level of intuition, vice versa.

In the light of above discussed findings, we may assume that the quantum model theory of Conte *et al.* may provide a mathematical formulation to measure cognitive functions of the psyche. This method may be useful to explore the nature of psyche and help for cleaning the dark side to evolve into a "human being", as Jung suggested. We expect new advances also at the level of clinical applications.

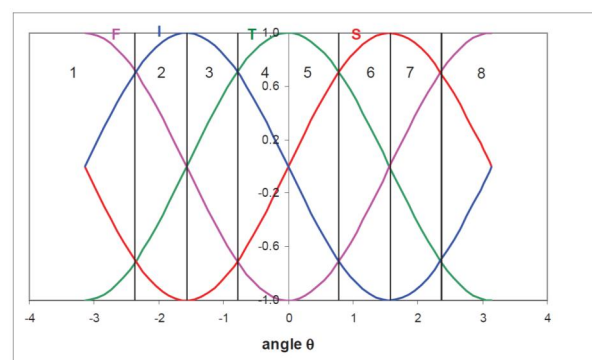


Figure 5. Expected behavior schematization of Jung's psychological functions (by the courtesy of Conte *et al.*).

Conclusion

Our interpretation of the reality is influenced by many factors, like knowledge, experiences and senses etc. Our psyche operates being a structure with very high complexity,



perceiving the internal and external inputs and processing this information as an output, to learn and to react. Each reaction will be carried in a probabilistic manner, mediated by the continuous interplay of opposed cognitive functions.

Jung has been highly inspired by the ancient symbol T'ai-chi T'u, when he proposed his eight-compartmental model. Like Yin and Yang, opposed psychological functions follow a

mutually interdependent, consuming and a transformable pattern. They display quantum entanglement with the attitudes. The resultant attitude is the probabilistic outcome, which is linked to predominating function(s) at that moment of decision. The function(s) we favor will determine the dominance of either the conscious or the unconscious components of our psyche.



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