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Brief Commentary

Brief Commentary Based on Article "The Atomic Structure and Law as the Scientific Foundation of Traditional Chinese Medicine"

Kunming Xu*

College of Ocean and Earth Sciences, Xiamen University, Xiamen, Fujian Province 361102, China

Traditional Chinese medical theories resemble the law and order of electronic orbitals within atoms. The principle of yin and yang interaction may be illustrated by the relationship of both 1s electrons in a helium atom; the principle of five element generation and overcoming cycles can be found in the outer electrons of a carbon atom; and eight trigrams coincide with eight electrons in a neon shell. The natural pattern is single for various parallel entities. The ancient theories in vague and general statements suffer endless doubts and disputes until we have formulated the electronic orbitals in precise mathematics to support them [1]. The breakthrough in the field of atomic structure has a great implication in Traditional Chinese Medicine (TCM).

The based article has established the dimensional transformation relationships between both 1s electrons in dynamic calculus of spherical quantities (Figure 1). The rotation of one 1s electron results in another 1s electron, and rotating an electron twice results in itself after a transformation cycle. Mechanically, when you twist a strand of hemp or fiber in a fixed direction, and then let it fold back, you make a rope. A rotatory operator $\int(-\partial/\partial t)dl$ upon an electron may be regarded as a kind of twisting tension so that electronic transformations of figure 1 constitute the art of making a rope with Ω_0 and Ω_2 as two partaking strands. Both strands are intertwined together, with one strand representing yin, and the other strand yang. The helium shell provides a model for many other systems with dual elements.

***Corresponding author:** Kunming Xu, College of Ocean and Earth Sciences, Xiamen University, Xiamen, Fujian, China, Tel: +86 13666020697; E-mail: kunmingx@xmu.edu.cn

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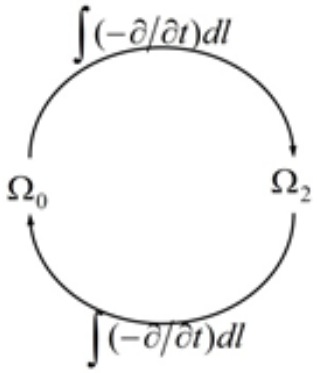

Figure 1: The cyclic transformation model of both 1s electrons in a helium atom.

In a DNA molecule, both time and space strands of polynucleotide are twisted together and bonded by hydrogen bonds between nitrogenous bases, A=T and C≡G. The double helix may be regarded as stepwise oscillatory *LC* circuits [2]. Each base pair is regarded as a capacitor, each phosphate bridge as an inductor, and each deoxyribose as an electric switch. An inductor impedes alternate current but allows direct current to pass. A capacitor cuts off direct current but allows alternating current to pass, and hydrogen bonds realize this wave connection. An electron passing through a hydrogen bond experiences two states Ω_0 and Ω_2 of 1s electrons in progression. This is a circuitry and chemical bond interpretations of the yin and yang pair (Table 1).

Scope and entity	Two strands		Interaction or specialization
General sense	Space	Time	Two symmetric dimensions
Light	Electric field	Magnetic Field	Electromagnetic wave
Helium shell	Ω_2	Ω_0	Circular functions in rotatory operation
DNA	A	T	Hydrogen bonds between nitrogenous bases capacitor
	G	C	
Zygote	Ovum	Sperm	Fertilization
Body	Yin	Yang	Ventral versus dorsal aspects
Family	Wife	Husband	Marriage and sex
Life	Plant	Animal	Photosynthesis versus Aerobic respiration
Biosphere	Abiotic	Biotic	Disorder process versus order process

Table 1: The yin and yang rope structure in life phenomena.

If the genetic substance is a rope, then one may expect that the organism encoded by the gene is a rope too. An organism develops from a single zygote resulted from the fertilization of an ovum with a sperm. An ovum is a pure spatial sphere whereas a sperm is a temporal point in symmetry with it. They are a pair of yin and yang, like the

pair of 1s electrons. The multiplication of a zygote cell leads to the sex distinction of the individual that carries the predominating hormone for all his or her life. An organism is chiral, like a carbon atom bonded to four different substituents. We inherit yin and yang from our parents. Among other space and time denotations, the ventral and dorsal aspects of a human body also constitute yin and yang poles [3].

Sex division allows the male and female to develop in time and space respectively, maximizing human capabilities. He is driving and thinking while she is expecting and feeling. The male gonad is basic, and the female gonad is acidic. The distinction of both sexes prohibits chemical neutralization or electric current between them. Only during sexual intercourse do pulses of seminal fluid pass through the reproductive organs. Hence we may compare this sex polarity between man and woman with the electric capacitor between DNA nitrogenous bases that delivers pulsing signals. A husband and a wife play the time and space roles of the family respectively. This cultural orientation is similar to the helium shell within which both electrons form a yin and yang pair (Figure 2). Thus there is an analogous pattern of yin and yang interaction within a helium atom, a DNA molecule, a zygote, an organism, a family, etc. Yin and yang pair can be explained from the perspectives of mechanics, circuitry, chemistry, and biology along with TCM in a coherent manner. Yin and yang are two poles of a capacitor, which are complementary, orthogonal, and inductive to each other.

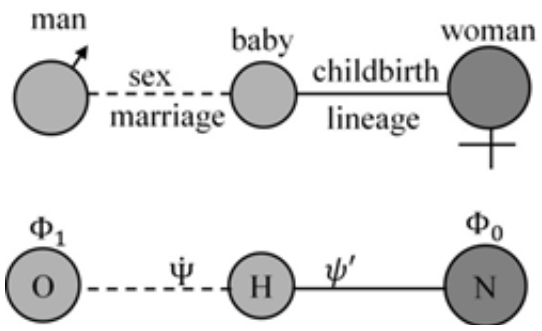

Figure 2: The biological bond between a man, a woman, and a zygote (fetus) through the reproductive canals (the dotted and solid lines) analogous to a typical hydrogen bond O---H-N.

As we discussed the structure of a helium or a neon atom, the electrons within the atom undergoes a complete cycle, rendering the system insulated from the environment, and hence their inert chemical property. Conversely, a carbon atom is chemically active because it has only four electrons $2s2p_x2p_y2p_z$ in the outer shell. The half full electron configuration gives it maximum capability in forming chemical bonds with the other atoms. That the carbon atom is the central backbone in most organic molecules is not by accident but by the rule. Because of its tetravalent tendency to bond with the other atoms, a carbon atom is not an insulated system. Although the principle of stable electron octet remains unchanged, the shifting of octet location from within an atom to inter-atoms in an organic molecule gives it great scalability. For example, a desktop application is self-contained, but an internet application is not. The latter is much more powerful thanks to its extrovert property. The advent of extrovert carbon atoms gives the potential of interatomic chemical bonds that make organic molecules and then biomolecules possible.

An *LC* oscillation circuit is an idealized electromagnetic circulation. The electric charges in the capacitor drive the electric current to pass through the inductor. The alternate current then induces magnetic flux in the inductor, which provides it with an electromotive force in the circuit, charging the capacitor in the reverse polarity. The insulated *LC* oscillation continues back and forth cyclically. By contrast, a stepwise *LC* oscillation circuitry in a DNA molecule is an open and scalable system because its *LC* circuits shift their location every next cycle along the sequence due to the electric current routing property of deoxyriboses (Figure 3). Although the principle of *LC* oscillations remains unchanged, only the extrovert stepwise *LC* oscillations make it possible for DNA to become the blueprint of life. Of particular importance are the hydrogen bonds that hold the base pairs together. The mathematical expression for the relationships of 1s2s2p electronic orbitals may be adapted to characterize the electron flow through a hydrogen bond.

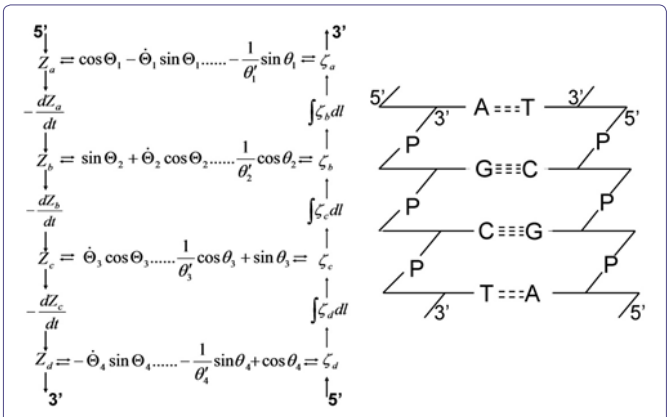

Figure 3: Mathematical formula of a DNA molecule along with its abbreviated chemical structure. Radian angle Θ_i complements radian angle θ_i. Arrows indicate electron flow, contrary to electric current direction.

The communication of wave signals between each base pair is through hydrogen bonds, which are implemented by the chain rules of dynamic calculus. The wave propagates from the nitrogenous base rings to the hydrogen bond bearing oxygen and nitrogen atoms (equation 1), and then to the hydrogen bonds (equation 2):

$$-\frac{1}{\theta'}\cdot\dot{\Theta}=\frac{dl}{d\theta}\cdot\left(-\frac{d\Theta}{dt}\right)=\int(-\frac{\partial\Phi_0}{\partial t})dl$$

$$=\int A_2\cos\psi dl\cdot\left(-\frac{dA_1\cos\Psi}{dt}\right)$$

$$=A_2\int\cos\psi d\psi\frac{dl}{d\psi}\cdot(A_1\sin\Psi\frac{d\Psi}{dt})$$

$$=-A_1A_2\left(-\frac{1}{\psi'}\dot{\Psi}\right)\sin\Psi\sin\psi=\Phi_1,\ (1)$$

$$-\frac{1}{\psi'}\cdot\dot{\Psi}=\frac{dl}{d\psi}\cdot\left(-\frac{d\Psi}{dt}\right)=\int(-\frac{\partial\Omega_0}{\partial t})dl$$

$$=\int C_2\cos\beta dl\cdot\left(-\frac{dC_1\cos\alpha}{dt}\right)$$

$$=\int C_2\cos\beta d\beta\frac{dl}{d\beta}\cdot\left(C_1\sin\alpha\frac{d\alpha}{dt}\right)$$

$$=-r\omega C_1C_2\sin\alpha\sin\beta=\Omega_2,\ (2)$$

where Φ_0 and Φ_1 denote 2s2p electrons within the nitrogen and oxygen atoms involved in each hydrogen bond, Ω_0 and Ω_2 1s electrons passing through each adjoining proton of the hydrogen bond, and the equal signs indicate the progress of electric pulses between the base pair. The meanings of all spherical quantities here are similar to those in the based article [1]. Thus the wave signal burrows through the

base pair by differential and integral chain rules. Hydrogen bonding is a dynamic electric action that delivers messages between the two bases, helping to balance the strains in the double helix. It is the narrowest gateway in delivering alternate current between nitrogenous bases. In biological sense, a hydrogen bond is such a key connection between the nitrogenous bases that the calculus chains -1⁄ψ' and Ψ may be regarded as the gonads of yin and yang organisms respectively in figure 2.

It is interesting to note that the formulae of electronic orbitals can be customized to describe DNA molecular wave functions. Such mathematical uniformity for diverse natural phenomena reflects the universality of the natural law. The discovery of the atomic structure and law has a great influence over the mathematical expression of a DNA molecule and beyond. If the gene can be modeled by a principle similar to the atomic structure, then the body can be modeled in the same manner. That is why the five element theory, which coincides with a carbon atom property, fits into the description of a human body in TCM.

Since it is the wave of 1s electrons that burrows through the five electronic orbitals $2s2p_x2p_y2p_z2s$ in the carbon atom, a six organ theory has been rationally suggested as an alternative to the five element theory [4], in which brain is added to the traditional five organs: lung, kidney, liver, heart and spleen. Brain best corresponds to 1s electrons in the inner spherical layer so that the six organ generation cycle would be 1s (brain)→2s (lung)→$2p_x$ (kidney)→$2p_y$ (liver)→$2p_z$ (heart)→2s (spleen)→1s (brain). If you omit 1s (brain) in the series, then the cycle is composed of five elements in the usual sense.

The ancient Chinese developed the yin and yang theory, the five element theory, and eight trigrams with incredible talents through their long term experience. But these theories have not been well regarded by Western scientists until recently when we broke a new ground in quantum mechanics and found exactly the same patterns of electronic orbitals within atoms. Through meaningful comparisons, we have established the main connections between the atomic structures and TCM models theoretically. The yin and yang theory corresponds to the space and time model of a helium shell, and the five element theory corresponds to the electronic orbital model of $2s2p_x2p_y2p_z2s$ within a carbon atom, both forming the foundation of TCM. A hydrogen bond of yin and yang can be modeled by the same mathematical formulae developed for the relationships of 1s2s2p electrons, providing a sound template for the characterization of diverse biological phenomena (Table 1). Eight trigrams correspond to the electronic octet within a neon shell. When applied to the interatomic occasions, the octet paradigm allows the construction of macromolecules. The genesis of life is not without preparation of organic compounds but following the course from inorganic to organic molecules and from abiotic to biotic forms.

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