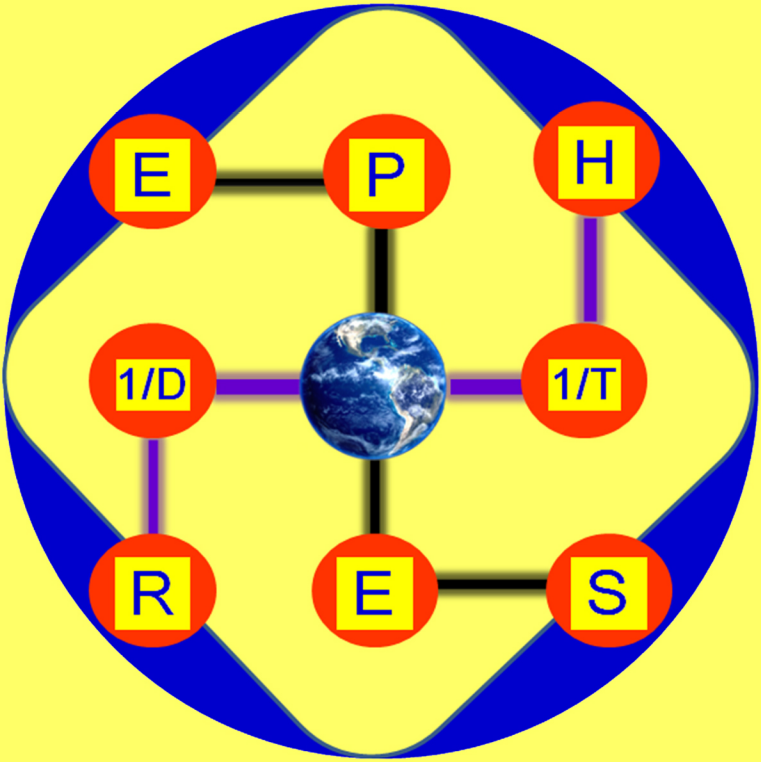
The Theory of Physical Particles and Yi Field



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PREFACE

The Theory of Physical Particles and the Yi Field is also termed Li-Yi field theory or Liyi. Combining the traditional Yi concept and the five-element theory of Li Yin and Yang, it integrates the analytical results of Western natural science. It also forms the Liyi time-space concept of the theory of quaternions. In particular, four fundamental principles are based on the Li Yin-Yang/mass-energy-time-space four-image principle of nature and are supplemented by the conservation of field momentum, the Li Yin-Yang principle of interaction, and complex energy conservation. Arising from the basic conceptual dynamics of "matter, motion, time-space, energy, force, and equilibrium", the theory presents these so-called principles and rules in terms of a simple mathematical model utilizing the mathematical time-space principle and methods of basic derivatives/calculus. It explains Newtonian mechanics, relativity, and quantum wave dynamics and reveals the threefold nature of the particle/wave-particle-field. In the process, Maxwell's electromagnetic (rotary dynamics) equations are interpreted and spirit and matter are combined to achieve the Yi theory of the united field.

This theory has a simple mathematical basis and is conceptually clear. It is concise and easy to understand and is suitable for science curricula in liberal arts schools. It is ideal for self-education by students in liberal arts schools as a means of organizing and developing physical knowledge. It also provides a foundation for the future development of physics and practice. The theory as presented in this book can also be used in various types of seminars and is suitable for professionals and lecturers in colleges.

CHAPTER 1

INTRODUCTION

The *Theory of Physical Particles and the Yi Field*, also called *Liyi field theory* or *Liyi*, integrates the rational outcomes of Western natural sciences with traditional Yi theory and the Li Yin-Yang five-element theory of the East, forming the Liyi time-space concept of the theory of quaternions. Four basic principles of the dynamics are found in the four-image principle of Li Yin-Yang/mass-energy-time-space. They are supplemented by the Li Yin-Yang principles of interaction, field momentum conservation, and complex energy conservation. Using these four basic principles, the theory illustrates the so-called principles/laws and rules with a simple mathematical and physical model using the mathematical time-space principle and methods of basic derivatives/calculus and according to the fundamental dynamic concepts of "matter, motion, time-space, energy, force, and equilibrium". It provides a perspective on dynamics with which to discuss Newtonian mechanics, relativity, and quantum wave dynamics. Furthermore, it reveals the tripartite nature of the particle/wave-particle-field; in turn, Maxwell's equations of electromagnetic rotary dynamics can be interpreted and spirit and matter are combined to achieve the Yi theory of the united field.

Liyi contains ***Three Treasures***, i.e., the three-Yi principle, also called the ***methodology of "three-talent" thinking***. Reasonably, we can select the "duality sub-system" as a reference system for making further observation. This is described in the following.

1. The features of the three-Yi principle are: “unchanging”, which can be interpreted as meaning that it does not change and does not move in accordance with the standard rules and laws of the universe; “it becomes easy”, which can be interpreted as referring to the fact that everything in the universe changes and follows a set of rules; and finally “it is simple and easy,” which is interpreted as meaning that it has its basis in simplicity and easiness. Because it is *easy and simple*, people can easily follow the approach, enabling good results with less effort. Finally, it complies with causality.

2. The method of *three-talent thinking* is the cognitive method used to unite the three types of Yi, combining ‘connotation-physics’, ‘connotation-mathematics’, and ‘connotation-humanities’ into one; it has three aspects of meaning.

3. We can reasonably select the “duality sub-system” as an observational system. The instruction to “shun the complicated and tackle the simple” found in the concept of Liyi is conditional and is predicated on a set of principles. The *eight-rigid dialectics* of Liyi are also manifest. Here **eight-rigid** refers to: Yin and Yang; motion and rest; cohesion and divergence; and rigid and soft (with the overall principle founded on Yin and Yang). This eight-rigid concept provides an outline for the classification of everything.

In modern empirical science, the so-called *theory of the unified field* aims to “unify the four major forces”. Liyi field theory is not discussed as part of existing theory, but can be studied with modern science and modern language from the perspective of a principle/law/rule. The concepts of Western Newtonian mechanics, relativity, quantum mechanics, and Maxwell’s electromagnetic equations are studied in terms of dynamics, and their fundamental problems are discussed. The dynamic factors of mass-energy, time-space, electricity-magnetism, and equilibrium stability cannot be separated from the concept of the field; the field has a real existence, but is invisible and untouchable. These concepts are all manifestations of

energy. Chinese Yin-Yang five-element theory represents traditional physics and the five elements—water, fire, gold, wood, and soil—that constitute all things in this world. These five elements also have the feature of bearing a cardinal direction, as found in the five-element diagram, "round outside and square inside" (round sky and square ground), which is also the current form of the field and energy manifestation. The universe is essentially composed of energy, and material and spiritual characteristics are united, constituting a single property.

1.1 A new view of time and space

Field theory concerns the problem of time and space. We know that time and space (termed time-space for brevity) have a real existence that is invisible and untouchable. Chinese traditional culture considers "east and west" as time and space, while "north and south" are considered matter and energy. There is an old saying in China: "if east-west is not found, then look for south-north". What does this mean? *As a time-space frame, east-west* has shape without image, while *south-north*, as a mass-energy frame, has image without shape. Thus, the *concept of time-space-mass-energy* unites shape and image, giving us is the main idea of the theory. United in this way, it is possible to describe the idea of mass-energy-time-space using algebraic and geometrical approaches.

Liyi theory has a four-image nature and encompasses the quaternary multi-dimensional theory of the time-space concept; this can be illustrated using mathematical equations and graphs. The surrounding material world (substance) contains four basic mass-energy-time-space properties and features a corresponding Yin-Yang relationship. Herein, mass-energy and time-space dualisms are paired as Yin and Yang and constitute all existing things. Not even the smallest particles are excluded since they can be described by their carrier/environmental time-space (t, r) in addition to their time-space (T, D). This represents quaternary multi-dimensional time-space

theory, which is also associated with the dynamic relationship between Yin-Yang and motion-rest.

The mass-energy-time-space concept of the four-image nature for Li Yin-Yang indicates that time-space cannot exist without mass-energy. The idea of the Li Yin-Yang mass-energy-time-space concept can be represented by a four-image diagram, which has a circular outside and a square inside. In this image, we can see how momentum (p)-energy (E) and time-space are paired as Yin and Yang, forming four images that display four cardinal directions. The tripartite nature of the particle/wave-particle-field is shown in the center of the diagram, expressing the idea that what is located in the center is essential. The *Liyi mass-energy-time-space four-image principle* (also called the first principle of energy) reveals that energy is the essence of the universe. A human being has a material body and a spirit, but this matter and spirit are both manifestations of energy. Matter and spirit are united in a single property, with spirit playing a leading role. The Li Yin-Yang mass-energy-time-space four-image nature (matter nature) and the property of the wave-particle-field tripartite nature (spirit) are united in all life and objects. This combination manifests itself as one type of electromagnetic wave in our space.

1.2 The basic principle of Liyi dynamics

Macroscopic and microscopic time-space show coherence and thus mass, energy, time, and space are united within a particle (quantization). The time-space concept of quantization implies that time and space are matter and energy and that the time-space concept exists in the form of a field. The field is both invisible and untouchable and, therefore, mass-energy cannot be separated from time-space; *mass-energy-time-space* is a four-image representation in one entity. The four basic principles of the relevant dynamics are briefly described in the following.

1.2.1 The relativistic kinetic relationship between mass, velocity, and energy

We adopt the relativistic method of Feynman's physics and delineate the field's dynamic relationship with physical-mathematical activity as its center. In this model, the mass-velocity relationship is the key. To investigate the dynamic relationship between "mass, energy, time, space, field, and force", we established a connection between velocity, energy, and force, and listed the derivative/differential paired equations according to the existing theory of relativity. We have adopted a simple Newtonian method to calculate the original function from the derivatives and move towards the final mass-velocity-energy algebraic relationship. There are three things to note in this process: 1) we adopted Feynman's mathematical techniques to derive the full differential equation; 2) we determined the integral parameters for "full velocity"; and 3) we retrieve the separated time factor $1/\Delta t = 0$.

The four images were then combined to obtain the following equations:

$$\text{(Work)}\ \ F \cdot v = \Delta E \,/\, \Delta t \tag{1-1}$$

$$\text{(Force)}\ \ F = \Delta p \,/\, \Delta t = \Delta(mv) \,/\, \Delta t \tag{1-2}$$

knowing that

$$E = mc^2 \text{and}\ \ p = mv \tag{1-3}$$

which, when solved, yields

$$m^2c^2 = m^2v^2 + {m_0}^2c^2 \tag{1-4}$$

we can also write

$$F \propto (\Delta p)(1/\Delta t),\ \ \Delta t \propto \alpha T \tag{1-5}$$

$$F \propto (\Delta p)(1/\alpha T)$$

After deriving the mass-velocity-energy-force algebraic mathematical relationship for particles (which can be universally applied), we can further divide these particles into four types for more convenient analysis. This is connected to force and four time-space variables. (Note: the experimental law of empirical science is not relevant here!)

The original law of the universe is called the principle. This law is a description of this principle. The law and rule are linked to certain specific properties of matter. If we suppose that there is coherence between Liyi theory and the mathematical description of the physical principle/law, the Liyi time-space concept, and the first principle of energy, then they are also cohesive in the other principles/laws/rules mentioned in the following parts.

1.2.2 LY action and interaction principle

In physics, most theories mention a relationship of interactive potential/force between similar types of matter. First of all, the potential energy of an interaction can be expressed as:

$$V(r) \propto x_1 x_2 \,/\, r \qquad (1\text{-}6)$$

As for the gradient of the interactive potential function $V(r)$, $\Delta V(r)$, when r and Δr approach specific stable values, the expression of the interactive force between two particles is as follows:

$$V(r)/\Delta r = -k x_1 x_2 \,/\, r_2 \;\; [i.e. f(r) = -f(1\,/\,r_2)] \qquad (1\text{-}7)$$

Equation (1-7) show the *Li Yin-Yang law of interactive potential-equilibrium force* (also abbreviated as **LY**). Here, f and f' are two forces of different properties, $f(r) = \Delta V(r)\Delta r$, $f' = k x_1 x_2 \,/\, r_2$, where r is the distance between the two sides of the interaction. The smaller the distance, the larger the interactive force, which results in increased stability. Here, x could be matter, charge, or magnetic charge at the molecular level (or another level), while k is the conversion coefficient of the dynamics. Li Yin and Yang causality reveals that "potential" and "force" are a paired form of Yin and Yang, with potential as the cause (Yin) in the first place and force as Yang in the second place. The radial rate of variation of interactive potential energy is the interactive force.

Equation (1-7) derives, for the first time, the LY principle according to natural principles and is one of the four central dynamic pillars of Liyi. It plays an essential role in the Yi theory of the united field and yields many

new dynamic relationships or laws. We list two such relationships in the following part.

(*1*) *Two laws derived from the LY principle*

The first law is derived from the force (Yang/divergence) on the right side of equation (1-7), which yields:

$$f'(r) \propto (k)(x_1 x_2)(1/r_2),$$
$$r \to \eta > 0,\ f'(r) = k x_1 x_2 / r_2 \qquad (1\text{-}8)$$

Equation (1-8) reveals that only the interactive actions of absorption and repulsion exist when two objects with different Yin and Yang properties encounter each other. These two actions correspond to each other and lead to energy equilibrium. This is the mathematical expression of the law of equilibrium for the YN (universal) interactive force, which complies with the squared inverse-proportional law; η takes on a specific value (with a smaller value implying a larger interactive force) and there are also other factors involving mass, energy, time, space, and matter fields.

The second law is derived from the force (which does not exist in modern empirical science) on the left side of equation (1-8) as follows:

$$f(r) = \Delta V(r) / \Delta r$$
$$f(r) \propto \Delta V(r)(1/\Delta r);\ \ \Delta r \to "\xi" > 0 \qquad (1\text{-}9)$$

Equation (1-9) reveals that the spatial variation rate of interactive potential energy is a magnetic force or source force (Yin/cohesive). If ξ is smaller, the interactive potential force is larger, and this is the cause of the interactive force. These two laws constitute a causal relationship.

(*2*)*Renaming the "Universal Law of Gravity"*

Liyi replaces the current formulation of universal gravity in empirical science with the *YN equilibrium law of interactive force*. Why is that? First, both of them are significant, which is self-evident; second, universal gravity cannot be considered as a full explanation, as there is not only an attractive force that exists between things in the universe, but also a repulsive force, so that the law of relative equilibrium and stability can be achieved. These

attractive and repulsive forces are in a mutual causal relationship. Newton also described this in terms of an "interactive force" and claimed that it was similar to his other inventions—it is merely the "phenomenological description" of truth in the universe (because the origin of this type of force was not understood at that time).

1.2.3 The YN law of equilibrium force-uniform circular motion

The relationship of field momentum conservation ($\Delta p/\Delta t = 0$) can be expanded as follows:

$$\Delta p\ /\ \Delta t = \Delta(mv)/\Delta t = m\Delta v/\Delta t + v\Delta m/\Delta t = f + f^{'} = 0 \quad (1\text{-}10)$$

Furthermore, we have:

$$m\Delta v/\Delta t = -v\Delta m/\Delta t, \text{ namely } f = -f^{'} \ (\Delta m \le 0) \quad (1\text{-}11)$$

where $f = m\Delta t/\Delta t$ and $f^{'} = v\Delta m/\Delta t$. f and $f^{'}$ are two forces with different properties. They are equal in magnitude, opposite in direction and act on the same object (with mass m). According to Newton's second law, a moving object with mass m is accelerated by an "external force". Eventually, we can derive the relationship of the equilibrium force as follows:

$$mv^2/r = -GMm/r^2 \ (i.e. f_{YN} = -f_{YN}^{'}) \quad (1\text{-}12)$$

This is the YN law of equilibrium force-uniform circular motion. This is also a principle/law and it has the following three important implications:

(1) The unification of gravity and electromagnetic force is achieved.

(2) One of the basic equations for the unification of electromagnetic force is obtained.

(3) In addition, three important differential relationships are obtained.

Table 1-1. Three differential relationships act across the entire Yi theory of the united field.

1	Rule of "no loss, no gain"	$\Delta m \leq 0$ $\Delta E_k \geq 0$	"Bottleneck", which is absolute
2	Rule of energy conservation in the universe	$\Delta V(r) = \Delta E_k$	Originates from the law of energy conservation
3	Differential rule of magnetism-electricity equilibrium	$\Delta(mv^2) = \Delta V(r)$	Time-space is united and full differential achieved

1.2.4 The principle of complex energy conservation

In the principle of complex energy conservation, according to Noether's theorem, the law of motion is invariant (i.e., independent of time/space) under a particular transformation. In other words, it possesses a certain symmetry and there must exist a corresponding conservation law and a pair of conserved quantities. Liyi is invariant for the time-space of complex energy:

$$A = E - [E_k + V(r)] = 0 \quad (1\text{-}13)$$

where A is complex energy; E is the energy of the system; $E_k$is kinetic energy; and $V(r)$is potential energy. By recognizing the concept of de Broglie matter-waves, we can obtain the algebraic expression for the wave function of electron particles, Ψ:

$$\Psi(t,\ r) = \Psi_0 exp\left[i\left(p \cdot r/\hbar'\right)\right] exp\left[-i(E_t)/\hbar'\right] \quad (1\text{-}14)$$

Using the differential property of the wave function, we can calculate the partial differential of $\Psi(t,r)$, with respect to t and r, and derive the algebraic expression for complex energy as follows:

(a) Complex energy: $E = i\hbar' \partial/\partial t$

(b) Complex momentum: $p = -i\hbar' \partial/\partial r$

(c) Complex kinetic energy:

$$E_k = p^2/2m = (-\hbar'^2/2m)\partial^2/\partial r^2 \qquad (1\text{-}15)$$

(d) Complex (total) energy: $E = E(t,\ r) = E_k + V(r) = (-\hbar'^2/2m)\partial^2\partial r^2 + V(r)$

We can introduce complex energy into equation (1-15) and calculate the dot product of it and the wave function of the complex vector: $A \cdot \Psi = 0$. By implementing factorization and merging similar terms, we obtain:

$$i\hbar' \ \partial\Psi(\mathrm{t},\ \mathrm{r})/\partial t = \left[\left(-\hbar'^2/2m\right)\partial^2\partial r^2 + V(r)\right]\Psi(t,\ r)$$

$$E\Psi = \widehat{H}\Psi \qquad (1\text{-}16)$$

Equation (1-16) is the YX differential equilibrium law/equation of complex energy. The right side shows the complex energy associated with the partial differential with respect to time. The left side shows the complex energy related to the partial differential with respect to space. The interpretation of this principle/law covers the following three points:

(1) The principle of energy conservation/equilibrium law and self-similarity.

The Liyi first principle of energy reveals that the four-image nature of particle-mass-time-space and the tripartite nature of the wave-particle-field are united in one component and exist in a universal system. As such, the features of symmetrical harmony and order of this system are also inevitably reflected in the particle, indicating the similarity between the particle and the system; symmetry and conservation correspond to each other in the universe. When one law of conservation is found, we can discover a pair of conserved quantities.

As for the conservation principle/equilibrium law, Liyi describes the common mode. That is, at a certain time-space point(t,r), a particular object possesses a characteristic energy function $f(t,r)$, and "energy conservation" implies that there is a maximum in the variation of this function in time and space:

$$\Delta_{tr}f = \Delta_t f + \Delta_r f \to f + f' = 0\ (A = 0) \qquad (1\text{-}17)$$

where $\Delta_{tr}f$ is a variation of the function f in time; $\Delta_t f$, that in space, $\Delta_r f$. We can solve the equation for the law of equilibrium: $f = -f'\ (E\Psi = \hat{H}\Psi)$. Here, the left side is time-invariant and the right side is space invariant. Such a rule provides an essential basis or criterion with which to interpret Maxwell's equations of magnetic and electric rotary dynamics. Noether's theorem means that symmetry and conservation correspond to each other in the universe—when we identify a law of conservation, we can also find a pair of conserved quantities. Particles exist in the time-space field. The discovery of a particle allows us to find out the particle, wave, and field properties. The rule involved in finding discrete particles concerns the conservation/equilibrium law of particles with respect to the time-space field.

(2) The corrected name of the Schrödinger wave equation.

In 1926, in relation to the comment of de Broglie that "a particle is a wave, and a wave is a particle", Schrödinger presented an ingenious equation with the imaginary number *i*, i.e., the "wave equation of the (electron) particle" (1-17). Consequently, those hazy concepts enveloped in Schrödinger's equation in the past century, such as the confusion of paired operators, the analogy of Schrödinger's cat, and conceptual confusion of Ψ^2 and Ψ, can be resolved. The wave function of the (electron) particle, $\Psi(\mathrm{t,r})$, offers a comprehensive description of the state of existence of the particle and should be properly described as a holographic wave function.

(3) The law of atomic light and electromagnetic radiation: $\left[\Delta E_{n'n} = \Delta_{n'n} V(r)\right]$.

Two work functions are related to each other. The work of an electric force is given by $\Delta E = (Fv),\ \Delta t \to (\Delta p/\Delta t)\,(\Delta r)$ and the work of a magnetic force is given by $\Delta V(r) = f_{YN}^{'}\,(-\Delta r)$. Why should we make this distinction? This is because there is no such thing in modern empirical science. These concepts are all associated with particular principles and are very important, but they are rarely relevant to a more general discussion. Meanwhile, the law of light and electromagnetic radiation also involves the verification of Liyi's four basic principles/laws of dynamics.

1.3 Li Yin-Yang four-image and five-element diagram

In China's ancient physics, the five elements of gold, wood, water, fire, and soil constitute everything in the universe. This is not correct. Moreover, these five elements also have the feature of direction, as given in the five element diagram with a round outside and a square inside (or "round sky and square ground"), in which water, fire, gold, and wood occupy the four cardinal directions and the element of soil is found in the middle. Soil, at the center, represents a virtue, reflecting the idea that the element at the center is important. For example, faith is at the center of kindheartedness, righteousness, reasonableness, and intelligence, with faith as the first element. When these five elements in nature are compared to the Li Yin-Yang four-image and five-element concept, in which the four images of mass-energy-time-space are located in four cardinal directions with the particle at the center, the central element represents one image of five elements, i.e., it is the main entity that integrates the feature of the substance and spirit (i.e., the wave-particle-field's tripartite nature) into a single entity.

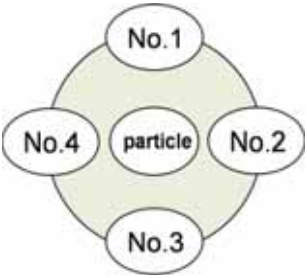


Fig.1-1. Four-image and five-element diagram of Li Yin and Yang

Fig.1-2. Pearls and jade combined

Furthermore, there are four fundamental principles of the dynamics concerning the particle/wave-particle-field's tripartite nature, which also constitute the four-image and five-element diagram of Li Yin-Yang. They form Yin and Yang pairs and are located in four cardinal directions with the particle at the center, as shown in Fig. 1-1. Based on these four fundamental principles/laws, we can further find the principle/law of a higher level, in section VII of field theory, where we discuss the principle/law for the dynamic resonance effect of matter-wave and the law of the rotary circular period.

In Fig. 1-1, "No. 1" denotes the principle/law of mass-energy-time-space four-image nature (particle/feature unity). "No. 2" represents the principle/law of action and interactive potential/force equilibrium (particle-field), while "No. 3" denotes the YN principle/law of field momentum (particle-field). Finally, "No. 4" denotes the Yi principle/equilibrium law of complex energy conservation (particle-wave-field) and "No. 5" denotes the particle/wave-particle-field's tripartite nature in the center, embodying the concept that the one in the center is important.

The rules of the universe are interconnected and continuously improve, as the implications of physical laws do. The amplitude of the vectors of resonant dynamic effects in the matter field are superimposed. The intensity is the squared scalar of the amplitude and the former manifests as complex time-space and is often not easy to observe. The former is Yin, while the

latter is Yang. One Yin and one Yang exhibit a dual dynamic effect and there is also the principle and law of the electromagnetic rotary circular periodic dynamic effect. Regarding the unity of the particle's wave-particle-field-resonance-spin, the particle is a wave and the wave exhibits rotation. Spin and rotation are manifestations of complex energy. Higher energy corresponds to a higher frequency (the reciprocal of time), while a shorter time cycle corresponds to a shorter particle wavelength. Resonance is one specific effect of the energy field, comprising "resonance", "assimilation", and "oscillation". Additionally, from the perspective of Yi theory, the nature of the resonant effect is found in the Yin-Yang combination and the resonance of everything. Yin and Yang combine and give birth to everything, reflecting the superposition effect of positive energy. The positive effect and positive energy are symmetric, harmonious, and ordered.

1.4 Maxwell's magnetic-electric rotary dynamic equations

Table 1-2. Maxwell's equations and interpretation.

Maxwell's magnetic (H) and electric (E) equations		**Preview of interpretation**
$\boldsymbol{\nabla \cdot E = 0}$	$\nabla \cdot H = 0$	Law of wave-rotary propagation for electromagnetic particle
$\boldsymbol{\nabla \cdot E = -\frac{\partial B}{\partial t}}$	$\nabla \cdot E = -\frac{\partial D}{\partial t}$	YM law of magnetic-electric equilibrium
$\boldsymbol{E = -\left(\frac{1}{\varepsilon}\right) D}$	$H = -\left(\frac{1}{\mu}\right) B$	Interpretation of the magnetic-electric state equation
The password to be decoded: $\boldsymbol{\nabla}$, $\boldsymbol{\partial/\partial t}$; $\boldsymbol{B}$, $\boldsymbol{1/\varepsilon}$, $\boldsymbol{1/\mu}$, $\boldsymbol{E}$, $\boldsymbol{H}$		Liyi four principles/laws

Through the four principles and laws of Liyi, we can connect the Yi theory of Tai Chi Yin-Yang and the Western theory of complex electromagnetic waves, integrating Maxwell's equations to reveal the rotational mechanism of particle-wave-field-spin unification of particles and deduce the law of magnetism-electricity equilibrium to obtain the rotary dynamic principle of electromagnetic waves.

Maxwell's equations (i.e., magnetic and electric equations) and a preview of interpretation are found in the following.

More than 150 years ago, the British physicist and mathematician James Clerk Maxwell achieved a great scientific breakthrough for humankind by formulating the classical theory of electromagnetic radiation. He expressed it using magnetic (H) and electric (E) equations that are simple, symmetric, harmonious, and ordered. Maxwell's equations integrate the beauty of Yi theory's physical and mathematical connotations, unite three into one, and bear many cardinal directions. This set of algebraic equations, in the form of a (3×2) matrix, has three features:

(1) Yin and Yang are symmetric, harmonious, and ordered, and form a system;

(2) Partial algebraic equations of vectors;

(3) There are eight password symbols, including E and H, and four spin, ∇, symbols.

These features provide a clue to solving the problem of the four principles/laws of Liyi. We need to keep two aspects in mind: first, since the number of unknown variables is higher than the number of equations, we must integrate other relevant algebraic equations to solve the problem; second, rotation connotes a cycle, the cycle of rotation, and the mechanism of rotary motion. This ensures that the interpretation of Liyi is different to any scientific method previously used.

Chinese people often look at things in terms of timely opportunities, geographical advantages, and popular support. Maxwell's equations, arising from a brilliant investigation, are like a lock that has to be opened with a set

of keys (passwords) from Li Yin-Yang four-image and five-element theory. In this, all the best—"pearls and jade"—are combined. The Maxwell magnetic and electric algebraic equations and the Liyi principle/law are united to solve electromagnetic particle-rotary circular periodic motion. Several conclusions can be derived from this:

(1) Electromagnetic waves are transverse waves, electric-magnetic amplitudes are perpendicular to each other, and the wave propagation direction of the particle.

(2) The electromagnetic wave-particle exhibits spiral propagation and a rotary circular periodic cycle, "S" (sinusoidal wave).

(3) Derivation of the YM magnetic-electric equilibrium law reveals that the electromagnetic rotary "S" sinusoidal wave is consistent with the "central curve" of the Tai Chi Yin-Yang "fish" (the Tai Chi symbol) and they represent a complex function with spin, ensuring that three rotary circles are united in one holographic function of an electromagnetic wave.

1.5 Liyi equations and diagrams of field theory

The physical laws developed in the later parts of this book do not completely comply with modern Western physics. The particle-physics-Yi field theory offers certain advantages that are manifested primarily in the following aspects.

(i) Liyi theory provides a definite view of time and space, the four-image nature, and the four multi-dimensional space-time concept/theory/equations. In this material world, all things consist of four basic mass-energy-time-space properties and have a corresponding Yin-Yang relationship. *Mass-energy* has an image without shape, while *time-space* has form without image. *Mass-energy* and *time-space* make a Yin and Yang pair and constitute all things, including particles. An electromagnetic particle must exhibit a carrier/environmental time-space (t, r) in addition to its time-space (T, D), which gives us the quaternary multi-dimensional

time-space theory. A factor of the dynamic Yin-Yang relationship and motion-rest also exists.

(ii) Liyi theory provides four basic principles/laws/equations of dynamics.

(iii) The introduction of a vector pair, S-T, in the theory of magnetism represents a bridge between mass-energy and magnetism-electricity. The universal mass-energy relationship is solved (covering Einstein's mass-energy relationship) and three phases (i.e., mass-electricity-magnetism) of matter are linked to the substance and its conduction properties. *Monism* plays an important role in improving Maxwell's theory of electromagnetic fields to a state of perfection, which is crucial for both modern physics and future science about the human body. Here, we emphasize a particular point: *time-space* is classified into first-order and second-order components. A first-order component is a linear time-space variable, as mentioned above. A second-order component is a squared variable. Linear time-space variables are connected to mass-energy, momentum, and energy. Second-order space-time variables are connected to electromagnetic/intensity. Two types of time-space variables are interconnected with velocity.

(iv) We provide an interpretation of Maxwell's equations of magnetic and electric rotary dynamics. The first of Maxwell's equations deals with the law/equation describing wave-rotation propagation of electromagnetic particles. The second of Maxwell's equations concerns the equilibrium law/equation of electric-magnetic forces (or energies) and unifies the four forces (of energies). The third of Maxwell's equations is the main equation revealing the conversion between mass-energy and electricity-magnetism; furthermore, it reveals the relationship between magnetic-electric strength and second-order (or even first-order) time-space, and the *mass-electricity-magnetism* tripartite nature of everything. These principles/laws combine to ultimately reveal the mechanism and rotary circular periodic laws governing the rotation of particles (i.e., *everything*) in the universe. Particle physics will develop in the direction of Tai Chi particle physics.

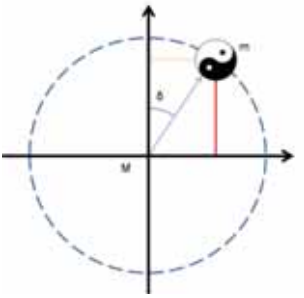


Fig. 1-3. Duality subsystem

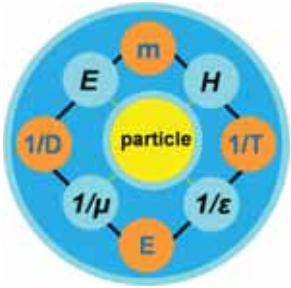


Fig. 1-4. Eight-order diagram of Liyi field theory

Fig. 1-5. Eight-order diagram and the million-character symbol

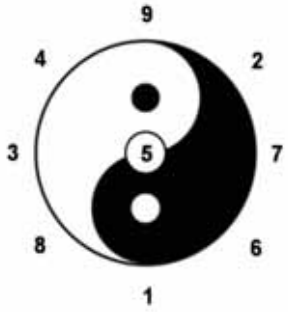


Fig. 1-6. Tai Chi Yin-Yang "fish"

The name of the four-image and five-element Li Yin-Yang diagram originates from a square and circular diagram. It is called *the five-element diagram of round outside and square inside* (with the center) or *the five-element diagram of the round sky and square ground* (with the center). Liyi field theory strives to integrate Western four-image and five-element Li Yin-Yang theory and Chinese Tai Chi Yin-Yang five-element theory.

Table 1-3. The equations for the Yi field theory of particle physics.

(Main) field equation	$\langle m\rangle \in \langle M\|m\rangle,\ m \ll M$ (duality observation system)
Particle is Tai Chi	$y = \cos\delta + i\sin\delta$ (Tai Chi is divided into Yin and Yang)
(General) electromagnetic wave function	$\chi = \chi(Eoej\delta,\ Hoej\delta)$ (rotary circular periodicity, transverse)
Tai Chi Yin-Yang wave function	$\Phi = \Phi o(cos\,\delta,\ i\,sin\,\delta)$ (rotary circular periodicity, longitudinal)

So far, modern empirical science has not achieved the unification of field theory. There are three probable reasons for this: first, it has not been found that the principle of energy conservation/equilibrium is the basic rule of the universe; second, the core of the modern empirical theory of science is the theory of the gravitational field, which cannot solve the unification of gravity and the electromagnetic force; third, quantum mechanics ignores the existence of complex space-time.

CHAPTER 2

A NEW UNDERSTANDING OF THE NATURE OF LIGHT

Abstract: Based on an understanding of the unity of matter and energy, we elaborate *the quaternary concept of time and space* in the perspective of the wave-particle-field triplicity of light. Herein, "quaternity" refers to the unity of four elements (mass, energy, time, and space). Time and space exist in the form of fields, as invisible forms of material existence. Similar to mass and energy, the time and space of a light particle are both discontinuous and discrete. In other words, besides the unity of the four elements—mass-energy-time-space—light also possesses *wave-particle-field triplicity (spirit)*. In the perspective of mathematics and physics, the "mass-energy-time-space" quaternity (four elements) of light is independent and shows correlation. This *independence* lies in the fact that none of the four elements is dispensable. The *correlation* means that changing one of the elements will change the others, indicating a dynamic relationship between the four elements of mass, energy, time, and space.

2.1 A fundamental change in the time and space concept

The historical development of physics shows how major scientific breakthroughs are often made using the concepts of time and space. During different stages of exploring nature, our understanding of time and space has changed. The universe was directly studied in ancient China and it was

believed that it consisted of time and space. The earliest conceptualization of time and space in history was made in China, with "Yu" referring to space and "Zhou" representing time. During the invention of his theory of mechanics, Newton proposed the concept of absolute time and space, providing the first coherent framework of time and space in scientific history. In the early 20th century, Einstein published the theory of relativity, noting that time and space are not invariant in nature. In his theory of relativity, Einstein proposed the concept of four-dimensional space-time (three-dimensional space and one-dimensional time) and established that space and matter could not be separated, which can be described as using physical fields that include the four-dimensional space-time framework. In this way, it was recognized that time and space were not abstract concepts anymore, but have specific physical meaning. However, current physics also recognizes that Einstein's theories of relativity and four-dimensional space-time only describe matter at the macroscopic scale and cannot be successfully unified with quantum theory, which describes the microscopic world and the behavior of elementary particles.

Historically, the scientific understanding of light developed from the idea of the particle to that of the wave, then to wave-particle duality, and, finally, to the current wave-particle-field triplicity. The suggested concept of mass-energy-time-space quaternity constitutes another stage in the development of space-time from a perceptual to a rational conception—one without unbridgeable gaps between macro-space and micro-space. All four quantities—mass, energy, time, and space—are discrete, quantized, and unified. This implies that both time and space have a material nature and thus a certain energy level can be ascribed. Presented in this way, "quantization" is no longer limited solely to the micro-scale.

2.2 The wave-particle duality of light

More than a hundred years ago, Hertz experimentally confirmed that light is an electromagnetic wave with a constant velocity; c denotes the velocity of light. Later, the German scientist Max Planck proposed that light, at different wavelengths, e.g., X-rays and visible light, is not irradiated at arbitrary frequencies (energy), but must be emitted in the form of quanta, with each quantum having specific energy (frequency): the higher the frequency of a wave, the greater its energy. Einstein recognized the concept of quantized light and believed that matter absorbs and emits energy "discretely", rather than continuously. Using Planck's simple equation, it is straightforward to derive the energy of a particle with a specific frequency (ν):

$$E = h\nu = nE, n = 1, 2, 3, \ldots \quad (2\text{-}1)$$

This equation shows that energy is not continuous, but rather discrete, meaning that it can be irradiated or absorbed as multiple packets, n, of characteristic energy, E. Einstein's theory of relativity gives the well-known mass-energy relationship for light quanta (or photons):

$$E = mc^2 \quad (2\text{-}2)$$

In equations (2-1) and (2-2), it can be seen that a photon of light with frequency, v, can behave as a particle of mass, m, which moves at the speed of light, c. The wave-particle duality of light has been confirmed by modem physics, especially with electrons and neutron experiments on the crystal lattices of solids, where elementary particles show positive or negative interference. Thus, electromagnetic light can be considered a wave (with specific wavelengths and frequencies) and a particle (with particular masses and energies). De Broglie discovered that the wave-particle duality of matter is the essence of nature. As such, establishing the wave-particle duality of light fundamentally changed the concepts of mass and energy for humankind. Matter and energy are not continuous, but are "discrete". In particular, the current understanding of the theory of relativity regarding the

wave-particle duality of light only considers matter and energy (duality) to be entirely inseparable. It does not incorporate time and space. The new concept of time and space derived from Liyi theory fundamentally changes this by recognizing the quaternity of light/electromagnetic waves and their tripartite wave-particle-field nature.

2.3 The independence and correlation of quaternity

What are the relationships between mass, energy, time, and space? It is essential to ask ourselves this question to understand the mass-energy-time-space quaternity properly. There is an old saying in China: “time is money, but money does not buy time”. This means that time has a limited duration that can be measured and is more precious than gold. Indeed, besides mass and energy, time and space are two of the essential components of the universe. They build up everything in the universe, but the nature of time and space is invisible.

Starting from these premises, we can say that light is naturally a mass-energy-time-space quaternity. In other words, the four elements (i.e., mass, energy, time, and space) of light particles are unified and inseparable. Each light particle has its mass, energy, time, and space, in addition to its other properties and characteristics; this is also true for other particles.

Now, we can introduce two physical variables, *T* and *D*, to replace the frequency (ν) and wavelength (λ) of light, where $T = 1/v$ and $D = \lambda$. Hence, the speed of light can be expressed as follows:

$$c = \lambda v = DT \left(T = 1/v,\ \ D = \lambda\right) \qquad (2\text{-}3)$$

Where T is the time variable and D is the space variable. These temporal and spatial variables are independent and correlated by the speed and energy of light. Following this approach, the other physical quantities can be expressed, as summarized in Table 2-1.

As shown by the symmetric relations in Table 2-1, the mass-energy-time-space quaternity better reflects the nature of light than the mass-energy

duality alone. These relationships are connected through two important kinetic parameters, c and h, and supported by universal principles as reflections of the exact laws of the universe. In the following, we provide mathematical proof of the independence and correlation of time and space.

Table 2-1. Summary of the mass-energy-time-space quaternity of light/electromagnetic waves.

1	Speed of light and time-space variables	$c = D/T = \lambda v;\ \lambda = D,\ v = 1/T;\ 0 < T < \infty,\ 0 < D < \infty$	
2	Energy (E), momentum (p) and time-space	$E = mc^2,\ p = mc$	$E = pc,\ p = E/c$
		$E = h/T,\ p = h/D;$	Reciprocal relationship: $E \propto 1/T,\ p \propto 1/D$
		$ET = h = pD$	Conjugate relationship, h is Planck's constant
3	Mass-energy and time-space	$m = E/c^2$	mass-energy equivalent, c-speed of light (parameter)
4	E/p and time/space ratio	$E/p = c = (1/T)/(1/D) = D/T$	
5	Light/Electromagnetic spectrum	microscopic$\leftarrow 1/(TD)$, visible time-space (T-D), （TD）$\rightarrow$ macroscopic	

2.4 The coherence of macro-space and micro-space

Within the universe, nothing can exist out of time and space; not human beings nor other things, regardless of their size or the level of observation, whether it is macroscopic or microscopic. We can describe the aforementioned three concepts of time and space with the most straightforward mathematical relationship and then verify the coherence of macro and micro-space. As we know, traditional Newtonian mechanics posits that the velocity of an object is equal in value to the distance traveled over the unit time. For photons, this relationship is expressed as follows:

$$c = S/t, \quad S = ct \tag{2-4}$$

where c is the speed of light and S is the distance the light travels in time, t.

The relativistic concept of space assumes that c is constant, while time and space can change. Applying the differential analysis, it yields the following relationship:

$$\Delta S = c\Delta t, \quad c = \Delta S/\Delta t = S/t \tag{2-5}$$

The greatest difficulty with Einstein's four-dimensional concept of time and space lies in how to select the "time-space metric" used to measure time and space. If we consider the speed at a given time as an average over a short period, it yields a ratio between a small distance (space interval) and a short time interval. If these intervals are infinitesimally small, they equal the exact speed at that point. Therefore, because time-space exists in fields, variables of time and space are independent and correlated, namely $\Delta S = nD$ and $\Delta t = nT$. Therefore, the following relationship exists:

$$c = \Delta S/\Delta t = nD/nT = D/T \ (n = 1, \ 2, \ 3, \ \ldots) \tag{2-6}$$

from which the following equation can be derived:

$$c = D/T = (1/T)/(1/D) \tag{2-6′}$$

where T and D represent temporal (i.e., the reciprocal of the frequency) and spatial (i.e., wavelength) scales of the light/electromagnetic wave particles, respectively; specifically, they represent the "time-space" metric. This time-

space metric is universal and does not depend on and change with a human's beliefs and assumptions. However, the type of metric differs for different spaces, i.e., the microscale and macroscale metrics are different. Here again, we have used a differential analysis that agrees with Einstein's four-dimensional conceptualization of time and space. Time and space exist as fields; for the space field, both shape and range (i.e., size) can be defined. We can select a three-dimensional (or higher dimensional) spatial projection appropriate to the situation when solving these problems. Therefore, it is desirable to connect the complementary concepts of "independent, correlated, and coherent" with a "discrete and discontinuous time-space" as an inevitable conclusion. As the most basic concepts used to describe physical motion, time and space must maintain their conceptual independence (duality) without artificial constraints between them. The coherence of macro and micro-space, as well as that of mass-energy and time-space, is unified by quantification. The concept of quantized time and space supposes that time and space have materialistic nature, energy, and exist as invisible fields; therefore, mass-energy is inseparable from time-space. The elements of mass-energy-time-space are unified.

2.5 The physical meaning of mass-energy-time-space quaternity

2.5.1 Mass-energy-time-space quaternity for X-rays and visible light

The quaternity relationship of light (Table 2-1) shows that light has mass and mass, energy, and light frequency can all be understood as equivalent. As frequency is reciprocal to time, the mass and energy of light are inversely proportional to the strength of the time (space) field. It is for this reason, elementary school students can use simple formulas to calculate the mass, energy, time, and space of a light particle of a given wavelength.

Table 2-2. The mass-energy-time-space quaternity for X-rays ($CuK_{\alpha 1}$radiation) and blue light (B).

Quaternity	D-Space	T-Time		E-Energy	M-Mass
	$\lambda_d = d\ [m]$	$v = c/d\ [s^{-1}]$	$T = 1/v\ [s]$	$E = h/T = hv\ [eV]$	$m = Ec^2\ [kg]$
X-rays (X)	$1.54056\times10^{-}$	1.9460×10^{1}	$5.1387\times10^{-}$	8.0489×10	$1.4348\times10^{-}$
Blue (B)	4.4715×10^{-7}	6.7045×10^{1}	$1.4915\times10^{-}$	2.7730	$4.9430\times10^{-}$
X/B ratio	ibid	2.9025×10^{3}	ibid	2.9026×10	2.9025×10^{3}
B/X ratio	2.9025×10^{3}	ibid	2.9025×10^{3}	ibid	ibid

Constants*: $c = 2.9979 \times 10^{8}\ m \cdot s^{-1}$, $h = 6.6262 \times 10^{-34}\ J \cdot s = 4.1360 \times 10^{-15} eV \cdot s, 1\ J = 6.24192 \times 10^{18} eV$

For example, in the wavelength of the X-rays from uK_{α}, the radiation is $= 1.54056 \times 10^{-10}\ m$ and the wavelength of blue light (B) is $\lambda = 4.471 \times 10^{-7} m$. First, let $D = \lambda$. From the velocity, $c = D/T$, the time scale, $T = D/c$, is calculated with the frequency as its reciprocal, $v = 1/T$. We can further derive energy and mass. We also know Planck's constant, $h = 6.6261 \times 10^{-34}$ Js and the speed of light, $c = 2.9979 \times 10^{8}\ m/s$. Therefore, we can calculate the mass, energy, time, and space of X-rays and blue light, and compute their ratio. The results are shown in Table 2-2.

The order of magnitude of the energy of visible light is the $[eV]$ (electron volt); X-rays have higher energy than visible light. The energy, mass, and frequency of X-rays are nearly 3,000 times higher than those of visible light (see Table 2-2). High energies have extensive penetrative capabilities; therefore, the spatial scale of X-rays (rather than visible light)

can measure the interval and spatial distribution of atoms in crystals. Human eyes can only see visible light emitted by objects on the molecular level. The Planck-Einstein quantum theory notes that the absorption and emission of energy from a blackbody is not continuous, but discrete. Similarly, the elemental unit of mass-energy-time-space suggests that the time-space of a light particle is the same as its mass and energy and, therefore, discontinuous. These four elements are unified and inseparable. The scale of the temporal and spatial fields of visible light is nearly 3,000 times longer than X-rays. Humans live in a macroscopic, low-energy time-space environment. The visible light detected by the human eye can only show the shape and size of objects on the molecular level. Consequently, objects are perceived in this form, though their true manifestation may be different. For example, how does an object look under a microscope? It may seem loose and composed of small molecules like sand grains in motion, but this is invisible to the human eye.

2.5.2 The fundamental kinetic elements of quaternity

The electromagnetic spectrum is generally one-dimensional. It is delineated using a straight line from low to high frequency (or from long wavelengths to short wavelengths). It can also be represented as a two-dimensional electromagnetic spectrum, as shown in Fig. 2-1, with one axis for frequency (ν) and the other for wavelength (λ). Based on the mass-energy-time-space quaternity of light/electromagnetic waves, we can combine the energy-momentum vector diagram with the two-dimensional electromagnetic spectrum into a single spectrum diagram, as shown in Fig. 2-1 and Fig. 2-2. This provides more information about energy and momentum changes at both microscopic and macroscopic levels.

We may recall that Einstein's theory of relativity concerns shifting the momentum and energy of particles, positing that many physical problems can be solved by relating energy, momentum, and the space-time concept.

Therefore, the ratios between energy, momentum, and time-space in Table 2-1 yield the following equation:

$$E/p = c = (1/T)/(1/D) \qquad (2\text{-}7)$$

The *blue vector line indicates the energy-momentum vector* in Fig. 2-4; two axes represent reciprocals of time, 1/T, and space, 1/D. These observations lead to the following three points:

(1) the slope of the vector line is the speed of light, *c*;

(2) the coordinates of any point on the vector line (E, p) are the energy and momentum of a light particle with corresponding time and space (1/T, 1/D);

(3) the starting point of the vector line approaches (but never equals) zero. The larger the time and space variables (i.e., the more macroscopic), the lower the electromagnetic wave's energy and momentum, and vice versa.

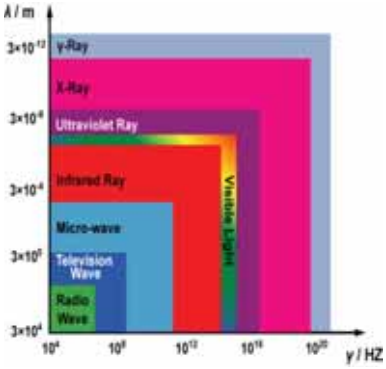


Fig. 2-1. The two-dimensional electromagnetic spectrum, wavelength (λ) vs. frequency (ν)

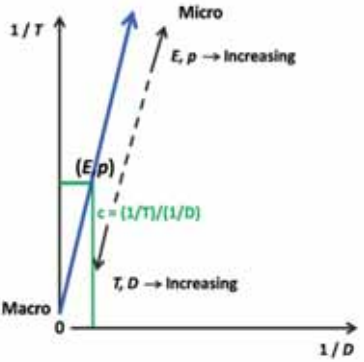


Fig. 2-2. Two-dimensional vector spectrum of an electromagnetic wave: energy/momentum vector diagram, E/p vs. (1/T)/(1/D)

Furthermore, the E-p vector extends between microscales and macroscales to form a two-dimensional electromagnetic vector spectrum. The more microscopic the particle, the greater the energy $(E = h/T)$ and

momentum $(p = h/D)$, and vice versa. The E/p ratio always remains unchanged, as indicated by equation (2-7). This two-dimensional electromagnetic spectrum contains plenty of information. The spectrum extends infinitely from low frequencies and long wavelengths near the coordinate origin to high frequencies and short wavelengths, with visible light occupying only a very small portion (see Fig. 2-1). This implies that we can see only a very small part of the time-space reality in which we live and that the human world is relatively trivial. All materials in the human world consist of molecules and their nature is still a mystery that science is trying to solve. The microscopic world presents an even broader physical space with higher energy-matter. The minimal and maximal ranges of the universe are impossible for humanity to comprehend! Thus, the new quaternary concept of time and space offers a key to the mysteries of the universe. We must change our current understanding of time and scale to understand multi-dimensional space and discern its secrets.

2.5.3 The dual kinetic relationship between energy-momentum and time-space

Equation (2-7) shows the ratio between mass-energy and time-space as demonstrated by the speed of light; another kinetic parameter (h) provides the conjugate and reciprocal relationships between these ratios. Two physical quantities have a conjugate relationship when their product is constant. As shown in Table 2-1, the energy of light/electromagnetic waves is the conjugate of time, whereas momentum is the conjugate of space:

$$ET = h, \quad pD = h \tag{2-8}$$

The products of two pairs of physical quantities, (E, T) and (p, D), $ET = h = pD$, are equal to Planck's constant h. These two conjugated relationships offer theoretical validation of Heisenberg's uncertainty relationship. As we all know, the uncertainty relationship, as one of the basic theories of quantum mechanics, is an "assumption" developed

mathematically by Heisenberg through trial computation and validation. Bohr suggested that the origin of the uncertainty relationship is the wave-particle duality and proposed the famous principle of complementarity from philosophy. On this basis, the uncertainty relationship is limited by experimental approaches and is a consequence of the concept of science (different observers have a different view of the same action). From the perspective of the mathematical limit, for two physical quantities in the same system that are infinitely large and infinitely small, they are independent and correlated. They can even approach as close as to the real value as permitted by the limitations of the experimental methods used or our observational ability. The reciprocal relationship corresponds to the conjugate relationship. If two physical quantities have a reciprocal relationship, they are inversely correlated, and the coefficient of proportionality is a constant. It is easy to derive two reciprocal relationships from the conjugate relationship in equation (2-8):

$$E = h/P,\ \ p = h/D \tag{2-9}$$

Furthermore, both ends of two reciprocal relationships in equation (2-9) can be divided by the common factor, h, eliminating it and giving again a relationship (2-7) connected through the speed of light, c, $E/p = c = (1/T)/(1/D)$. As for the other aspect of kinetic factors, by differentiating parts of equation (2-9) per space and time, respectively, we can obtain the following:

$$E/p = c = (1/T)/(1/D) \tag{2-10}$$

Equation (2-10) indicates that moving particles can emit excessive energy and absorb any required energy by stretching their temporal and spatial scales to maintain their energy balance and stability. However, this ability is dependent on whether specific conditions and the external environment are matched. That is to say, the particle is not isolated, and there are other factors.

2.6 Description of the wave properties of any moving particle

According to de Broglie, everything has the nature of a wave. He correlated the wavelength and the momentum of a particle by saying that the larger the momentum, the shorter the wavelength:

$$p = h' /\lambda \tag{2-11}$$

where h' is a kinetic parameter related to work; λ is the wavelength; and p is the momentum of the corresponding wave; that is, $p = mv$, with v being the velocity (or speed) of the particles. Thus, we can determine that a particle with momentum, p, must have energy of $E = mv^2$. According to this wave-particle duality, a moving particle has the properties of a wave, with frequency ν and wavelength λ, which are related to momentum and energy (like the relationship between a photon and a light wave) as follows:

$$p = mv = h' /\lambda, \quad E = mv^2 = h' v \tag{2-12}$$

This equation indicates that the properties of any moving particle can be characterized by energy and momentum, just as for light particles, and the wave properties can be described by frequency (v) and wavelength (λ), which can also be related to two time-space variables, $D = \lambda$, and $T = 1/v$. Thus, the velocity of moving particles, v, can be expressed as follows:

$$E/P = v = \lambda v = D/T \tag{2-13}$$

then, D and T can be introduced into equation (2-12) to derive the following:

$$p = h' /D, \quad E = h' /\mathrm{T} \tag{2-14}$$

Therefore, the mass-energy-time-space quaternity of de Broglie wave particles, relativistic particles, and light/electromagnetic wave particles have a common form and are correlated with each other through kinetic parameters (v, h') to achieve a quaternary correlation of macroscale to microscale. As for these two sets of kinetic parameters, one is the velocity (or speed) v $(0 \le v \le c)$ that we are familiar with and the other is $(h' \ge h)$, where h is the Planck constant. Their dimensions are as follows:

$$[v] = [c] = [m \cdot s^{-1}], \left[h^{'}\right] = [h] = [\mathrm{J} \cdot s] = [eV \cdot s] \quad (2\text{-}15)$$

2.7 The real existence of multi-dimensional space in the universe

The universe is composed of particles at different scales. Microscopic particles are lighter and have higher energy. The time, space, mass, and energy of light/electromagnetic waves are independent and correlated and can be converted between one another. This process involves an exchange of energy with the external environment and space. Particles can have different sizes, and there is also space between these particles. The universe is composed of infinite-dimensional time and space. This paper presents a preliminary understanding of the concept of quaternity by an in-depth understanding of the nature of light/electromagnetic wave particles. The term particle can refer to an object so large that nothing is outside it or to a small object without an interior. Keeping in mind that everything has the feature of Yin and Yang, time and space form an independent and correlated Yin and Yang pair. The concepts described above are briefly summarized in the following three points.

- ***Time-space is not continuous, but discrete and "quantized"***

Time-space and mass-energy are unified in the so-called mass-energy-time-space quaternity. Time-space exists as an invisible field, embodied as energy, i.e., the time-space field is material and has energy.

- ***Particles are always in motion***

This motion is inseparable from matter and energy, as well as from time and space. Hence, the mass-energy-time-space quaternity of particles relies on its kinetic parameters and the velocity of a particle is the ratio of its space/time fields. Furthermore, the velocity of particles is the ratio between their energy and momentum. Therefore, the velocity and the four elements of its mass-energy-time-space (i.e., quaternity) are all kinetic

factors; when one changes, the others correspondingly change.

- ***Time-space is hierarchical***

Smaller particles have higher energies and higher time-space levels. The presence of multi-dimensional time-space is real and immeasurable. The number of levels for particles from the macroscale to the microscale corresponds to the number of time-space levels. Time-space has intervals that are not the same as levels of time-space; however, they are related. Consequently, we cannot use a macroscopic measurement tool to measure a microorganism and we cannot use visible light to observe a microscopic atom. This issue fundamentally changes the concept of time-space.

We can even say that the evolving conceptualization of time and space is a primary sign of a major evolutionary process in science. The motion of matter is regular. Philosophically, time and space must both be connected and independent (duality). Time-space must be linked to a specific physical entity, i.e., mass-energy (duality), and only depicts a particular physical reality. The new concept of quaternity reveals that multi-dimensional space with different energy levels is real and the universe is composed of an infinite number of multi-dimensional microscopic and macroscopic spaces. The universe contains multiple spaces with multiple energy levels and is essentially composed of energy, rather than common substances; this energy exists as a field. Therefore, understanding the nature of light/electromagnetic waves, namely the unity and equitability of the mass-energy-time-space quaternity, changes the appearance of physics and heralds the arrival of a new era.

CHAPTER 3

ALGEBRAIC RELATIONS BETWEEN RELATIVISTIC MASS, SPEED, ENERGY, AND FORCE

Abstract: This paper has its foundation in the theory of the mass-energy-time-space quaternity of Li Yi (the first of four basic principles of the field theory of physical Yi theory). Here, Li refers to particles (generally, it refers to all things). Yi refers to Yi theory, which reveals the laws of the existence and functioning of all things in the universe according to the physical principles/theorems/laws as interpreted by this theory. Yi implies that everything contains elements of Yin and Yang. Particles (as with all things) are divided into Yin and Yang types (this division is called dualism). They can be further divided into the four categories of "mass, energy, time, and space" (also called the four elements). This framework enables our understanding of all materials. The particles also have the properties and spirit of wave-particle-field triplicity. Modern Western mechanics possesses the symmetry of Yin and Yang and can be connected through relativity. The traditional Chinese theory of Yin, Yang, and the Five Elements includes the concept of Western quadruplicity and the property of orientation. The essence of Einstein's theory presents the symmetry of Yin and Yang.

3.1 L Y E principles and theorems

3.1.1 The first principle of energy

The principle of mass-energy-time-space quaternity for the Yin and Yang of Li reveals that, regardless of size, a particle (or any other object) has the nature of mass-energy-time-space quaternity and this inherent aspect defines any material. It also has the properties/spirit of wave-particle-field triplicity and "material and spirit are united as one". Energy is the basis of the universe (this is known as the first principle of energy). Fig. 3-1 depicts the five-element diagram of mass-energy-time-space for the Yin and Yang of Li.

Two lemmas can be used to express Li Yi theory:

Lemma 1: Both real and virtual particles have properties of mass-energy-time-space quaternity and wave-particle-field triplicity: "everything has Yin and Yang" and "one Yin and one Yang are **Tao**", which is the heart of Yi theory. The **Tao** is the law and the rule. Li Yi says that "Yin and Yang are independent, although they are correlated"; they are also united. Thus, everything is relatively independent and there is a relationship between Yin and Yang.

Lemma 2: Based on the idea and methodology of the united theory of Yi, physics, and mathematics (the so-called *three powers*), the following statement can be made: a physical entity does not solely possess a material nature and matter and energy are interchangeable. Therefore, all matter also has a spiritual nature. Only the united spiritual and material properties of energy can constitute a complete object, just as the unity of thought and matter constitute life itself.

Fig. 3.1. Graphical representation of the principle of mass-energy-time-space quaternity for the Yin and Yang of Li

The diagram of Li Yi five-element dynamics shows that momentum-energy (p-E) and time-space ((1/T)-(1/D)) are two pairs corresponding to Yin and Yang, with the particle (wave-particle-field triplicity) in the center. This reflects thinking in traditional Chinese culture in which the "center is above, at a higher position".

3.1.2 Theorems of interpretation of the basic principle

Theorem 1: The quaternity of the Yin and Yang of Li.

Table 3-1. Quaternity of the Yin and Yang of Li

1	Mathematical rule of wave-particle duality: velocity is related to time and space	$v = D/T = \lambda v;\ \ D = \lambda,\ \ T = 1/v$
2	Energy, momentum, and speed are related	$E = mv^2;\ \ p = mv$

3	Velocity is related to mass-energy and time-space	$E/p = v = D/P = (1/T)/(1/D)$
4	For particles m (T, D) and ambient time-space/carrier M (t, r), we have $v = v(t, r)$	
5	The two particle system: $\langle m \rangle \propto \langle M \mid m \rangle$， $m \ll M$;	
6	The five-element diagram of Yin, Yang, and the four elements of Li (also known as the five-element diagram with a round exterior and a square interior)	

With their specific physical meanings and their relationships to each other, these mathematical symbols are very important. The two variables of time-space are expressed as reciprocals; this has a profound meaning in that microscopic objects (1/TD, small) have higher energy (or momentum), while macroscopic objects (TD, large) have lower energy. This also concerns the concept of the space-time limiting rule. The universe, then, is ruled by the simultaneous increase of energy and regulation.

Theorem 2: The Existing relevant theory of relativity.

Table 3-2. Existing relevant theory of relativity.

1	Einstein's theory of relativity	Mass and energy are variable	$\Delta m \neq 0$， $\Delta E \neq 0$
2	Feynman's relativistic physics	Power is the rate of change of energy over time	$F \cdot v = \Delta E/\Delta t$

3	Dynamic relation of Newtonian fields	Force is the rate of change of momentum over time	$F = \Delta p/\Delta t = \Delta(mv)/\Delta t$
4	Associated equations of Feynman's relativistic physics		

3.1.3 Unified cognitive methodology of Yi-physics-mathematics

In the previous discussion on the quadruplicate view of space-time, we addressed the unified cognitive method of Yi, physics, and mathematics. This method considers three aspects, i.e., Yi has three principles. These are as follows.

- **It does not change.** Using the universal *Dafa* principle as a standard, it does not change and does not move.
- **It does change since everything in the universe is constantly changing.**
- **It is simple.**

These are the basic preconditions for understanding. Because everything becomes easier and simpler when we follow natural rules, this method is easy to understand and follow. Furthermore, it yields good results and complies with causality.

The quaternity view of space-time for the Yin and Yang of Li states that space-time cannot exist independently without mass-energy and also has features of orientation. The diagram of the mass-energy-time-space quaternity for the Yin and Yang of Li, which has a round exterior and a square interior (Fig. 3-1), reveals that momentum-energy and time-space are two pairs corresponding to Yin and Yang as four images in four cardinal directions. Li, or the "wave-particle-field" triplicity, is located in the center, reflecting the idea that the center is above and on a higher level. The principle of the mass-energy-time-space quaternity of Li Yi (also called the

first principle of energy) reveals that energy is the basis of the universe. A human being has a physical body and a spirit because both matter and spirit are manifestations of energy. Matter and spirit are the same and are united, although the spirit plays a leading role. For any living creature and physical object, the mass-energy-time-space quaternity of the Yin and Yang of Li (a material property) is united with properties of the wave-particle-field triplicity (a spiritual property). The nature of this particle is manifested as an electromagnetic wave in space, having wave-particle-field triplicity and being central to the particle's existence.

An original rule of the universe is called a principle, while a theorem is the interpretation of that principle. Laws and rules are related to certain specific properties of matter. Physical principles and theorems can be interpreted through Yi theory and mathematics, and the algebraic relationship between the mass, speed, energy, and force of particles (and of all things indeed) is derived by combining the quaternary view of time and space in Li Yi with the first principle of energy. Four types of particles can be distinguished for examination. In the following, we apply the relativistic method of Feynman's physics and describe the relationships of field dynamics with physical-mathematic relations at its core. The mass-velocity relation is the key. Moreover, to find the dynamic relations between "mass, energy, time, space, field, and force", we must establish the relations between velocity, energy, and force. According to the existing relevant theory of relativity presented in Theorem 2, we can list the associated equations of derivatives, apply the Newtonian method to calculate the original function from the derivatives, and obtain the desired algebraic relations between mass, velocity, and energy. The method is very simple. There are three key points to note in the process: 1) application of Feynman's mathematical formalism to derive the complete differential equations; 2) determination of the integral parameters for "full velocity"; and 3) retrieval of the separated time factor of "$1/\Delta t \neq 0$".

3.2 The mass-velocity-energy equation of moving objects and the solution thereof

3.2.1 Feynman's differential equations of relativity

Particles that are "alive" and move regularly can be called moving objects. All moving objects have mass-energy-time-space quaternity and wave-particle-field triplicity. Feynman noted in physical relativity that, if and only if the force continues to act on a moving object, energy and mass will continue to increase. Feynman proposed an important relation stating that the rate of change in energy over time is equal to the product of force and velocity (or speed), i.e.,

$$F \cdot v = \Delta E \,/\, \Delta t \tag{3-1}$$

where v is the particle's velocity; $\Delta E/\Delta t$ is the rate of change in energy over time; and F is the force that causes the momentum of the moving object to change with time. This force can be derived from the dynamic relation of the Newtonian field as follows:

$$F = \Delta p \,/\, \Delta t = \Delta(mv) \,/\, \Delta t \tag{3-2}$$

then, the moving particle has energy and momentum, given as

$$E = mc^2;\ p = mv \tag{3-3}$$

where m is the mass of the moving object; c is the speed of light; and v is the velocity of the moving particle. In the following, we begin from these four basic relations and derive the well-known general formula of the mass-velocity-energy relation using simple calculus.

3.2.2 Derivation of the mass-velocity-energy relationship of moving particles

We substitute equation (3-2) into the left-hand side of equation (3-1), obtaining $F \cdot v = \Delta(mv) \,/\, \Delta t$, and then substitute equation (3-3), $E = mc^2$ into the right-hand side of equation (3-1), obtaining $\Delta E/\Delta t = \Delta(mc^2)$. We establish the equality of the two sides and derive a new

differential relationship:

$$v\Delta(mv)/\Delta t = \Delta(mc^2)/\Delta t \qquad (3\text{-}4)$$

then, we can apply a mathematical method used in Feynman's derivation and multiply both sides of equation (3-4) by *2m*,

$$2mv\Delta(mv)/\Delta t = 2m\Delta(mc^2)/\Delta t \qquad (3\text{-}5)$$

By removing the common time factor of $1/\Delta t(\neq 0)$ from equation (3-5), we can derive a full differential equation,

$$\Delta(mv)^2 = (m^2c^2) \qquad (3\text{-}6)$$

We know that if derivatives of two physical quantities are equal, the original functions that describe the quantities differ by, at most, a constant (or a parameter), which is herein denoted as c_1. After integration, we find:

$$m^2c^2 = m^2v^2 + c_1 \qquad (3\text{-}7)$$

We require equation (3-7) to hold at full velocity. We assume that when $v = 0$, the mass of the particle is $m = m_0$, which we substitute into equation (3-7) to obtain $c_1 = m_0^2c^2$; we then introduce c_1 back into equation (3-7) and derive the general formula for the mass-velocity-energy relation as follows:

$$m^2c^2 = m^2v^2 + m_0^2c^2 \qquad (3\text{-}8)$$

Equation (3-8) is a multi-variable non-linear algebraic equation in which, except for parameter *c*, the other three quantities (m, m_0, and v) are all variables; when $v = 0$, the mass of the moving particle is $m = m_0$. Equation (3-8) is one of the fundamental relations for the future field theory of physical Yi theory and it is called the universal mass-velocity-energy relation or YF. Here, "Y" refers to "Yi", as in physical Yi theory, and "F" refers to the method of derivation introduced by Feynman.

3.2.3 Solution for time factors

In applying the methods of Newtonian calculus to derive the original function from the derivatives, we must be careful about the definite-integral parameters. We must retrieve the separate relations of the time factor and

force. Based on the dynamic relation of the Newtonian field, $F = (\Delta p)(1/\Delta t)$, the two factors on the right-hand side are independent, but also correlated. If we do not account for the time factor, only half of the problem is solved. As such, the question arises as to the exact way we should consider this factor. Starting from solving the relationship between the time-interval factor, Δt, and the time variable, T, of the moving object, and taking a random time interval $\Delta t = t_2 - t_1 = n_2 T - n_1 T = \alpha T$, we obtain:

$$F \propto (1/\Delta t),\ \Delta t \propto \alpha T\ (\alpha = 1,\ 2,\ \ldots,\ \alpha \text{ is not necessarily an integer}) \quad (3\text{-}9)$$

Therefore, for the moving particle, the interaction force is inversely proportional to time. Thus, we can only qualitatively divide the particular situation into the following three regimes for consideration:

a) For microscopic time and space, T is very small, $\Delta t = \alpha T$ is very small, and α is limited. Because $\Delta t \propto T$, $1/\Delta t$ is large, the interaction force of microscopic particles is large.

b) For macroscopic time and space, T is large, α is limited, and Δt is large, therefore, the interaction force of macroscopic particles is small.

c) Relativistic time and space lies between the microscopic and macroscopic scales, and the interaction force of relativistic particles also fits between the other two regimes:

$$F \propto (\Delta p)(1/\Delta t),\ \Delta t \propto \alpha T,\ F \propto (\Delta p)(1/\alpha T) \quad (3\text{-}10)$$

According to this, smaller sizes (of particles and everything) yield more extensive interaction and are subject to a constraining force, making the system more stable.

This derivation process implies several scenarios:

(1) Solving the YF mass-velocity-energy relation, it is assumed that the mass of the particle, m, is equal to m_0 when $v = 0$. Thus, we solve for $c_1 = m_0^2 c^2$, where m_0 is mass at rest and there is no so-called concept of rest energy $= m_0 c^2$ in the current version of relativity.

(2) The speed of light, c, is a parameter, which does not mean that the speed of light is the highest possible physical speed.

(3) When Feynman derived the mass-velocity-energy relation, he did not address the factor of time and therefore did not obtain the full solution. As such, Feynman's derivation has resulted in the fuzzy concept of space-time and fields in current relativistic theory, which is subject to the constraint of the original view of time and space.

3.3 Equations of relativistic mass, velocity, energy, and force

An original rule of the universe constitutes a principle, while a theorem is the interpretation of that principle. Laws and rules are regulations of certain specific properties of matter under the premise of principles/theorems. They are used to interpret certain behaviors and phenomena. It is quite natural to use principles and theorems to solve differential equations. The associated algebraic equations of relativistic mass, velocity, energy, and force (collectively called the relativistic laws of mechanics for Li Yi) have been obtained and are listed in Table 3-3.

The algebraic equations of relativistic mass, velocity, energy, and force include six components:

(1) The YF mass-velocity-energy relation $m^2c^2 = m^2v^2 + m_0^2c^2$ is the principle equation, where m is the kinetic mass, m_0 is the static mass, and v is the velocity, all of which are variables. We have $m = m_0$ when $v = 0$ and c is a parameter.

(2)-(4) From the relations for velocity (i.e., the space/time ratio of a particle) and the variations in energy and momentum relative to velocity, the momentum and energy appear as conserved physical quantities and are, therefore, particularly important.

(5) The kinetic relation of the Newtonian field is also a concept that is improved in this framework.

(6) The particle-ambient space-time field/system reveals that the particle is not isolated. Instead, it exists within a certain space-time

field/system; the particle itself also exists in the form of a field, which is also a part of the system.

Table 3-3. Equations for the algebraic relations of relativistic mass, velocity, energy, and force.

1	YF mass-velocity-energy relation: $m^2c^2 = m^2v^2 + m_0^2c^2$, where m is the dynamic mass, m_0 is the static mass, v is velocity, and c is a parameter.		
	m, m_0, and v are variables and $m = m_0$ when $v = 0$.		
2	Rule of velocity relation for wave-particle-field triplicity	$v = D/T = \lambda v = v(t,\ r)$	$D = \lambda,\ T = 1/v,$ $0 \leq \mathrm{v} \leq \mathrm{c}$
3	Energy is the product of mass and the square of the velocity	$E = mv^2$ (includes $E = mc^2$)	$v = D/T = (1/T)/(1/D),$ $(0 < T,\ D < \infty)$
4	Momentum is the product of mass and velocity	$p = mv$	$\alpha = 1,\ 2,\ \ldots,\ \alpha$ is not necessarily an integer
5	Kinetic relation of the Newtonian field	$F \propto (\Delta p)(1/\Delta t)$, $\Delta t \propto \alpha T$	
6	Particle-ambient space-time field/system	$\langle m \rangle \propto \langle M \vert m \rangle,$ $m \ll \mathrm{M}$	Particles are not isolated

In summary, the algebraic equations for the relativistic mass-velocity-energy-force relations have three features:

(i) The set of relativistic equations of Li Yi incorporates the beauty of the unified approach of Yi theory, physics, and mathematics; it is simple, symmetric, harmonious, and ordered. In a sense, it is comparable to Maxwell's equations of electromagnetism (in fact, it also provides the necessary information to interpret Maxwell's equations). Herein, the mass-velocity relation refers to full-velocity (general) electromagnetic wave particles. It includes the mass-velocity equation, which Einstein applied only to electromagnetic waves, with a wave velocity of *c*.

(ii) The distribution of matter (substance) in the universe is regulated. Yi theory suggests that, "for everything in the world, it will rise if it is light, and it will sink if it is muddy". According to the YF mass-velocity relation, $m = E/v^2$, "light" (meaning a kinetic mass) refers to high velocity and high energy and thus a particle with low mass will rise; "muddy" refers to a static mass with low velocity and low energy, which will sink. Furthermore, "light" has the meaning of purity and what is light and pure will rise; "muddy" has the meaning of impurity and aging and what is muddy will sink and decline. The term "to sink" also implies heaviness. Smaller (microscopic) particles have greater energy, heavier mass, and stronger magnetism than bigger (macroscopic) particles (objects). Everything in the world is composed of atoms, and an atom is composed of electrons and nuclei. The mass of an atom is mainly concentrated in the nucleus. Let us make a simple analogy. If an atom is a football field, the nucleus is only the size of a bean located at the football field's center. Modern empirical science tends to inaccurately exaggerate the role of the nucleus.

(iii) The mass-energy-time-space principle of Li Yi (also called the first principle of energy) reveals that regardless of how large the particle (or anything) is, it possesses both the nature of mass-energy-time-space quaternity and the property/spirit of wave-particle-field triplicity. Material and spirit are the same and are united, while energy is the basis of the universe. Real particles and virtual particles both possess the nature of mass-energy-time-space quaternity and wave-particle-field triplicity.

3.4 Analysis of the algebraic YF mass-velocity-energy relation

Table 3-4. Classification of general electromagnetic wave particles according to their velocity.

1	Algebraic YF mass-velocity-energy relation: (1)$m^2(c^2 - v^2 = m_0^2c^2)$ (2)$m = m_0/\left[(1 - v^2/c^2)^{1/2}\right]$ (non-linear relation)		m is the kinetic mass, m_0 is the static mass, v is the velocity, and c is a parameter
2	Macroscopic low-energy particles $(0 \leq \mathrm{v} \ll \mathrm{c})$	$m \approx m_0$ $m \approx m_0 + 1/2m_0\,(v/c)^2$ $\Delta m = (m - m_0) = 1/2m_0(v/c)^2 \geq 0$	Physical molecules and phonons
3	Relativistic particles $0 \leq \mathrm{v} < c$	$M = m_0/\left[(1 - v^2/c^2)^{1/2}\right]$; $m \neq 0$, $m_0 \neq 0$; (1)$\Delta m \propto \Delta v$, (2)$\Delta m_0 \propto -\Delta v$	Negative electrons and electron-like particles outside the nucleus
4	Light particles $v = c$	$m_0 = 0$, $E = hv$, $v = 1/T$, $m = E/c^2$;	Electromagnetic wave particles at the speed of light, c
5	Superlight particles $v > c$	$E = hv$, $v = 1/T$, $m = E/v^2$;	Superlight neutrinos

The universal algebraic YF mass-velocity-energy relation in equation (3-8) is non-linear and cannot be solved directly. Additionally, the velocity

range is very large (from zero to the speed of light, c) and the corresponding differences in mass-energy and other properties are also considerable. For the sake of clarity, we can define the following categories of particles according to the magnitude of their velocity: macroscopic molecular particles; relativistic particles; electromagnetic wave particles at the speed of light; and superlight particles. The relativistic particle is the most universal and representative (see Table 3-4). For this particle, almost all kinetic physical quantities related to "time, space, mass, and energy" will change with velocity. This method of classification complies with the approach of modern science. There are similarities and differences between particles in both different and similar regimes; these can be very large.

Several clarifications need to be made for Table 3-4.

First, for macroscopic (molecular) particles $(0 \leq \mathrm{v} \ll \mathrm{c})$, such as phonons, there is a mass-velocity relationship for moving particles with low speed and low energy. The particles belonging to this regime approach the lower limit of relativistic particles. We can view v/c as a small quantity in the algebraic YF mass-velocity-energy relationship (2), which can then be expanded with the binomial mathematical theorem as follows:

$$m = m_0 + 1/2m_0(v/c)^2 + 3/8m_0(v/c)^4 + \cdots \qquad (3\text{-}11)$$

The first term on the right-hand side of this equation is static mass (m_0). The second term and the subsequent high-order terms of v/c are small compared to the first term and can be neglected. Therefore, the mass-energy relation of macroscopic particles is:

$$(1)\ \ m \approx m_0,\ \ (2)m = m_0 + 1/2m_0\ (v/c)^2;$$
$$E = \mathrm{m}v^2\ (0 \leq v \ll c) \qquad (3\text{-}12)$$

where m_0 is the mass of low-velocity particles (the inertial mass in Newtonian mechanics). The energy is also low because the velocity is low. Even the mass and the energy of macroscopic low-velocity particles increase as the particle velocity increases, exhibiting oscillations. The wave property is the manifestation of the periodicity and regularity of the motion of matter. All objects, ranging from large celestial bodies to very tiny

particles, oscillate.

Secondly, relativistic particles $(v < c)$ have three notable features:(i) neither the kinetic mass nor the static mass is equal to 0, i.e., $m \neq 0$, $m_0 \neq 0$. (ii) The kinetic mass increases as the velocity increases, i.e., $\Delta m \propto \Delta v$, whereas the static mass increases as the velocity decreases, i.e., $\Delta m_0 \propto -\Delta v$. For example, electrons in the shells outside the nucleus rotate at different velocities around it; their corresponding kinetic masses (m) and static masses (m_0) are also different. (iii) There is an extreme case in which velocity, v, approaches the speed of light, c, causing the denominator on the right-hand side to approach zero. To solve this equation, its numerator, m_0, (which is a variable) must also approach zero, i.e.,

$$v \to c, \quad m_0 \to 0, \quad m \to E/c^2 \tag{3-13}$$

In this situation, the mass of the relativistic particle is also limited. It should be noted that the process of solving such calculus must involve the limit problem of maxima and minima. According to Newton-Cauchy limiting theory, both the maximum and the minimum are variables and comply with the rule of limit operation,

$$\text{“}\infty\text{”} \cdot \text{”}0\text{”} \to \text{”}\eta\text{”}; \quad \text{”}0\text{”}/\text{”}0\text{”} \to \text{”}\eta\text{”} \tag{3-14}$$

where η is the limiting, variable value, representing a quantity with a definite physical meaning. It should be noted that Einstein adopted the Lorentz transformation and conservation of momentum to derive the mass-velocity-energy relation in current relativistic theory (3-12). He also assumed that when the velocity of accelerated electrons approaches the speed of light, *c*, the energy of those electrons will become infinite. He knew that this is not possible, but he was unaware of equation (3-12), for which the result is meaningful only when the numerator and denominator simultaneously approach 0 or ∞.

Some religious approaches have proposed that, in the algebraic mass-velocity-energy relation $m = m_0/\left[(1 - v^2/c^2)^{1/2}\right]$, when $v > c$, we can use direct substitution to derive the conclusion that “mass (m) is imaginary”. Li Yi disagrees with this argument.

Finally, electromagnetic wave particles with no static mass that travel at the speed of light also constitute a considerable family of particles. They have a common wave velocity, *c*, and different frequencies; the higher the frequency, the higher the energy. Frequency is the reciprocal of time, which means that small space-time has high energy. When a certain limit is exceeded, superlight particles will be found. Modern science has proven that neutrinos are superlight particles and may originate from high-energy particle radiation inside the nucleus (called subatomic radiation). These superlight particles do not have static mass and the magnetism of their kinetic mass is much higher than that of particles traveling at the speed of light. As such, they have a tremendous penetrating capability.

3.5 Corollaries to the laws of YF relativistic mechanics

Corollary 1. Einstein's principle of a constant speed of light is a law of common science.

Light is an electromagnetic wave with velocity *c*; it is a manifestation of energy. The energy of light is proportional to its frequency. A higher frequency means higher energy and the frequency is also the reciprocal of time. Microscopic particles have smaller temporal and spatial scales and higher energy. Colored light (including the seven colors of visible light) in general science is considered electromagnetic radiation originating from the particle interval (or virtual particles) of surface matter space. The surface matter field refers to the macroscopic matter field composed of the negative electrons and electron-like layers outside nuclei, molecular particles, and planets. Light is irradiated from objects and is a physical particle with the nature of mass-energy-time-space quaternity and wave-particle-field triplicity.

A light particle in this macroscopic ambient low-energy matter field will not be accelerated; rather, it will slow down. Here, the concept of "slowing down" is not the same as deceleration. Why? Slowing down means

that the path traveled by the light per unit-time becomes shorter, but the speed of light does not change; the cause of the shortened path is that the energy of the light becomes lower and the energy of the light is proportional to its frequency. In other words, there will be an energy exchange when light passes through a low-energy matter field. The frequency of the light will decrease, causing the light's path to shorten. The degree of shortening of the path is inversely proportional to the frequency of the incident light (the essence of the effect is that if the frequency is low, then light intensity is low, and the energy decays quickly). This may be the most direct explanation of Newton's "prism dispersion" experiment. On the other hand, this indicates that Einstein's principle of a constant speed of light is true in the purview of general science. The rules of the universe are linked and continue to grow.

Corollary 2. The speed of light is not the highest possible speed.

If light particles are in a high-energy field, their energy and mass can increase and they can accelerate. The mathematical proof is presented below. According to the kinetic relation of the Newtonian field,

$$F = \Delta(mc)/\Delta t = m\Delta c/\Delta t + c\Delta m/\Delta t = ma_c + c\Delta m/\Delta t \geq 0,$$
$$a_c = \Delta c/\Delta t, \ \Delta t \neq 0 \qquad (3\text{-}15)$$

where $a_c = \Delta c/\Delta t$ and $\Delta t \neq 0$. There are two possibilities:

(1) if $\Delta m = 0$, then $ma_c \geq 0$, $\Delta c \geq 0$ and the photons can be accelerated; or

(2) if the external force continues to act, the mass and energy of the photons will increase, $\Delta m \geq 0$.

If it is initially located in a high-energy matter field (as in the case of sub-atoms or microscopic particles), the emitted radiation can be superluminal. Modern science has proven that neutrinos are superluminal. What is the origin of this phenomenon? The scientific community has no conclusive answer.

We offer here an additional comment concerning variables and

parameters. The speed of light, *c*, is a parameter and not a constant. Just as the name implies, a constant quantity or number does not change, while a variable is a physical quantity that can vary across a relatively wide range. The parameters in this chapter are mostly "variables" about a certain limiting value. The range of the variation is relatively small, as in the case of c, h, and π; the maximum, ∞, and minimum, 0, are parametric-type variables.

Corollary 3. *The intention of the theory of relativity corresponds to the Yi theory of Yin and Ying.*

Western culture emphasizes the understanding of an object's appearance, while Chinese culture emphasizes understanding the meaning of things. These are two types of cultural systems with distinct characteristics; however, there is no contradiction between them, except for their different attitudes to understanding culture, the universe, and matter. They can complement each other, but cannot totally replace one another. If we appropriately combine elements of Eastern and Western traditional cultures, we can open a path to new ideas, reflecting the vitality of traditional cultures and providing dynamic guidance for further development.

3.6 Rule of "one into two and then one"

Particles are everything and everything is Tai Chi. Tai Chi is divided into Yin and Yang. The heart of Yi theory is that "one Yin and one Yang is the rule". The rule is the law and the regularity. There is an old saying in China that, "inquiring", meaning deducing things to gain knowledge, leads to the truth. We have previously elaborated on the four classifications of time and space and the four divisions of Yin and Yang particles, leading to the formulation of theorems and laws that adhere to the unified approach of Yi-Physics-Mathematics (referred to here as the "three powers"). Life does not exist in terms of a substance that is solely material in nature; as such,

any substance must also have spirit and only the unity of thought and substance constitutes the fullness of life. Therefore, the necessity of Yin and Yang (or virtuality and reality) is a very broad concept; positive and negative factors influence them both in the universe, and they are the necessary conditions for the evolution of cosmic energy. Without thoughts, substance alone is not sufficient to determine a pattern of movement and the presence of such "thought", along with its accompanying motive property, is the manifestation of energy. The discussion also returns to the reasoning of the previous text: *solid particles and virtual particles have the nature of mass-energy-time-space quaternity and wave-particle-field triplicity, and are subject to regulation and laws*.

3.6.1 Physical particles and virtual particles

Particles are classified into two categories according to the principle of Yin and Yang. One category is that of *physical particles (Yang)*, such as molecules, atoms, electrons, and nuclei, and free light/electromagnetic wave particles and phonons. The other category concerns virtual particles (Yin), which are usually bound in a material body and are therefore called latent particles (string particles). Physical particles and virtual particles both possess the nature of mass-energy-time-space quaternity and wave-particle-field triplicity. The virtual particles also have different classifications. The energy of a low-level space-time matter field leads to coarse particles with low density and little power. The ratio of the space/time fields of a particle is described as its velocity. Speed and velocity also have a relationship analogous to that of Yin and Yang, although velocity is more important. Speed has two aspects, magnitude and direction. For example, electromagnetic wave particles that travel at the speed of light have a common wave velocity, c, and different frequencies. Light is the key in answering the greatest mystery of the universe. As the most visible, purest, and active energy substance, light always represents life, vitality, and hope

in people's minds. Light is the manifestation of energy. The mass-energy-time-space quaternity and the wave-particle-field triplicity of light particles have both been described. Light has different colors because light wave particles have particular material properties and nature.

What is light? How is it produced and from where does it originate? Now we shall attempt to solve this mystery. Light is electromagnetic radiation that originates from the second characteristic structure of matter. To explain this, we need to explain both the first and second characteristic structures of matter.

A substance is composed of atoms. An atom is a sphere with a "heart" and a layered mass-electric-magnetic structure. Specifically, an atom is composed of electrons and a nucleus. The nucleus is very small, but has very high energy and is concentrated at the center of the spherical atom. We find a series of discrete layered shell structures called energy levels distributed outside the nucleus, which form the first characteristic structure of atoms. Therefore, we can express the varying energy-level differences and potential-energy differences between individual electron shells outside the nucleus with ΔE (or ΔV), which is also intrinsic to the substance and is called the second characteristic structure. Because the essence of the energy difference and the potential difference is the energy interval of the electromagnetic field, it is called an interval particle, a virtual, latent particle, or a string particle; those associated with molecular levels are called chemical particles. These negative particles (called "vibrators" by Einstein) have the specific nature of mass-energy-time-space quaternity and wave-particle-field triplicity; therefore, they are the source of all types of light/radiation.

Special note: more than a hundred years ago, Planck and Bohr discovered "discrete and quantized" light/radiation. How can this phenomenon be explained? At that time, there was no concept of the second characteristic structure of matter and it was explained as the "vibration of electrons" and the "transition of electrons"; this interpretation was thought ridiculous.

Einstein rationally concluded that if the energy of vibrators were quantized, then the electromagnetic field's energy, which generates light, should also be quantized. On the other hand, the authoritative experiments of Maxwell's theory indicated that light has the property of a wave. Thus, the concept of wave-particle duality was established in the academic community.

3.6.2 Physical particles and interval particles

The time-space interval is an energy interval and the smaller the time-space interval, the higher the energy. This secret can be discovered from diffraction studies. In the field of X-ray diffraction (XRD), we can use the well-known concept of Bragg's law in the determination of a crystalline structure:

$$2d \sin\theta = n\lambda \rightarrow 1/d \propto (2 \sin\theta/\lambda) \qquad (3\text{-}16)$$

where λ is the wavelength of the X-rays; n is any positive integer, also called the order number of the diffraction; d is the space between the crystal planes (spacings); E is the energy of the incident X-rays; and v is the frequency $(1/T)$. We now substitute:

$$\lambda = c/v = cT \qquad (3\text{-}17)$$

into equation (3-16) to obtain:

$$1/d \propto (2\, sin\,\theta/c)/T \qquad (3\text{-}18)$$

$$1/d \propto 1/T,\ E \propto 1/T \qquad (3\text{-}19)$$

Here are some brief clarifications and comments:

(i) The examination of objects has expanded our understanding of space-time and we can mathematically prove that the space-time interval is the energy interval; a small energy interval corresponds to higher energy.

(ii) Light is a class of electromagnetic radiation; it originates from the second characteristic structure of matter; here, we consider the intervals of the crystal surface as interval particles, which have a definite nature of mass-energy-time-space quaternity and wave-particle-field triplicity.

(iii) The absorption and radiation mechanisms of all matter are the

same and the matter has the instinct to maintain self-energy balance and stability.

We can further comment that this instinct is a deep-level spiritual process in a living body, whereas a low-level spiritual process could be a type of consciousness. This is reflected in the fact that all objects (including the human body) have the property of "expanding with heat and shrinking with cold", which means the unintentional release of excess energy (expansion with heat) or retention of energy (shrinking with cold). Other types of radiation, such as that from gaseous substance and thermal radiation, can be similarly explained, and they are all related to potential fields and forces.

3.6.3 The composition of the human body is linked to the universe

The human body is composed of various organs and cells. Cells are composed of molecules and atoms, while atoms are composed of microscopic particles, such as electrons and nuclei. Human sweat pores, the meridian and the veins, the acupuncture points of Chinese medicine, and the orifices of Taoism are all energy channels of the human body operating at different levels. Humans must have "thought"—matter that only has material substance does not exist and thus all matter must have "thought". Only the unification of thought and matter makes life complete. In the human sciences, only the existence of matter is recognized, while the existence of thought or spirit is not.

3.6.4 The contradiction between relativity and quantum mechanics vanishes

From the perspective of common science, relativity emphasizes the property of a particle of matter, while quantum mechanics emphasizes the wave property. These properties cannot be separated from the nature of

mass-energy-time-space quaternity for the Yin and Yang of Li and the wave-particle-field triplicity. Later, we will see that other subjects follow quantum mechanics and other disciplines. In other words, a real scientific system should have a set of systematic theoretical principles and a set of rigorous research methods and logical thoughts that are interconnected in a harmonious and ordered manner. The mainstream of modern Western science is based on materialistic studies that rely on tangible and visible logic and that provide obvious conclusions. The "superstring theory" of modern theoretical physics believes that, when the matter is too small, it no longer exists in the form of particles, but rather as a small section of an "energy string". (It is said that physicists were compelled to draw this conclusion for mathematical reasons!) From the perspective of the attribute relationship between the Yin and Yang of Li, that small section of "energy string" is a Ying property and is a string particle (or latent secondary particle). Empirical science seems to be going to another extreme, but what cannot be verified by experiments might still exist. In other words, if the logical thinking used is not correct, even those things that have been verified empirically cannot withstand scrutiny.

Everything has its phenomena and nature. The Yin and Yang theory in traditional Chinese culture says that everything has Yin and Yang. Neither Yin nor Yang can exist alone. They are united to be complementary and in harmony; everything exists relative to each other and there is a relationship between Yin and Yang—the relationship of reinforcing and neutralizing. This material world consisting of all things has the basic properties of mass, energy, time, and space, and a corresponding relationship of Yin and Yang. Mass-energy has a division and is indivisible and time-space does not have a division, but is divisible. Mass-energy and time-space are paired in Yin and Yang and constitute everything that can be and cannot be divided.

CHAPTER 4

LIYI THEORY: POTENTIAL EQUILIBRIUM LAW AND THIRD INTERACTION PRINCIPLE

Abstract: The Li Yin-Yang quaternity principle states that particles (or all other things) exhibit mass-energy-time-space quaternity and wave-particle-field triplicity, regardless of their size. According to traditional Chinese Yin-Yang theory, everything has Yin and Yang. Everything exists relative to everything else with a relationship of Yin and Yang—a relationship of mutual reinforcement and neutralization. This chapter reveals the law of interaction between objects with different Yin and Yang properties, particularly the potential and the force interactional relationship. For anything in the universe, there is a corresponding potential field/potential energy, the energy associated with an object's position, which varies at different points in space. Two particles interact because they experience the field generated by another at its location. Different Yin and Yang properties of substances cause attraction or repulsion, and these actions form a general energy balance.

4.1 The principles of Li Yin-Yang action and interaction

The principles of Li Yin-Yang action and reaction can be understood through the presentation of several simple theorems.

Theorem 1: Physical Yi field theory (**Liyi**) considers a particle to have field-particle duality regardless of its size; each particle has a type of energy, called potential energy (also known as latent energy) that corresponds to its energy level in the surrounding spatial field and is associated with its location. The potential energy of a particle has the property of Yin or Yang; in other words, there are Yin (negative) particles and Yang (positive) particles. Between particles of the same substance, similar polarities repel each other, while different polarities attract each other, forming interactional potential energy; the radial rate of variation of the interactional potential energy represents the interactional force, creating a relatively balanced/stable equilibrium state. The process of reaching this balance includes relativity, which comprises the dialectics and cooperation of Yin and Yang. An example of this process can be seen in magnetic (Yin) and electric (Yang) particles. They repel (reject) each other when Yang meets Yang and when Yin meets Yin, but attract each other in opposite cases; moreover, because of the respective field property (impenetrability) of Yin and Yang particles, repulsion and attraction cooperate to achieve a general relative balance/stability of energy (potential/force).

Table 4-1. Principles of Li Yin-Yang action and interaction.

◎ Physicists believe that the motion of objects, and indeed the motion of the entire universe, follows set laws.
◎Any piece of matter represents one or more objects and anything that really exists has the characteristics of an object.
◎All matter is the aggregate of a particle property and a field property.
◎All action in the universe is mutual. The relativity of Yin and Yang for the two sides of an interaction dominates the interactional potential and force and complies with causality.

Theorem 2: The methodology of thinking and cognition, concerning the unification of Yi theory, matter (*realization*) theory, and mathematical theory, is referred to as *Three Thinking*. Along with "realization", this methodology uses wisdom and thinking to discover a truth that can reconcile instinct and theory. What is reflected on the tip of the pen can only be an appearance because the true meaning resides at a deeper level. As for causality, the micro is the cause and the macro is the consequence. If we put them together, anything in the universe has an instinct to maintain its energy balance and stability. Instinct involves high-level thinking, while low-level thinking is consciousness; both are manifestations of energy. For example, both expansion with heat and contraction with cold are an ideal embodiment of this instinct in all things; the same is true for human beings. If our environment is hot, or if the accumulation of energy is high, we can relax for a while and release some energy; if our environment is cold, we can shrink the body to acquire some energy from the external environment to maintain balance and stability. This seems to be an instinctive action or behavior of all organisms and non-organisms. To achieve this instinctual reaction, we must keep ourselves in harmony and comply with our environment. This is the global outlook of "man as an integral part of nature" claimed in China's traditional culture.

Theorem 3: Particle-field duality is manifested in the following aspects.

(1) Any substance is an object and this property defines its practical existence. From the perspective of physical Yi theory, when particles with different Yin and Yang properties meet, the interactional potential/force also forms a Yin-Yang pair with implicit potential and explicit force. According to the principle of Yin-Yang interaction in Li theory, all action is mutual. The magnitude of the interactional potential/force is related to several factors, including the type, the Yin and Yang properties, and the spatial and temporal separation of the substances on the two sides of the interaction. Everything is active and there is a mutual action between any

two things. Attraction and repulsion cooperate to maintain a state of relative balance and stability.

(2) The principle of Li Yin-Yang quaternity reveals the quaternary nature of particles. Particles occupy the spatial field and have shape and distribution. Each particle has its property, and momentum and energy are related to both mass and velocity. The mathematical and physical relations among them can be written as follows:

$$E = mv^2,\ \ p = mv,\ \ v = D/T \qquad (4\text{-}1)$$

No particle exists in total isolation; each particle exists as an indispensable member of a certain field system of time and space (t, r).

(3) All matter has its own potential energy/field and Yin-Yang property, and the potential energy distribution of individual particles is usually described in terms of a central potential field, $U(r)$:

$$U(r) \propto x/r \qquad (4\text{-}2)$$

where x is the mass/quantity of the object and r is the spatial distribution of the potential field. This potential energy is also called the energy of position or latent energy.

The Yi theory is extremely simple and easy to handle, and the adopted mathematical method is also very simple. Yi theory can help us derive the law that governs the way things operate and change with time and space through its mathematical principle of time and space. Yin and Yang are two different aspects of a single thing and their behavior relies on three central theoretical pillars:

(1) Yin and Yang are relative.

(2) Yin and Yang are interactive and exchangeable.

(3) Yin and Yang constitute a single unity.

Everything has Yin and Yang. Yin is implicit, while Yang is explicit, and they are independent and related. Yin and Yang are complementary. Yin and Yang can reinforce and counteract each other on many levels. Everything has the basic properties of mass, energy, time, and space in our material world and has a corresponding Yin-Yang relationship. There are

eight dialectics—Yin-Yang, motion-stillness, meeting-parting, and rigidity-softness—with Yin-Yang as a general principle. Thus, Yin-Yang operates at the conscious level from the beginning, providing the outline and grasping the fundamentals of any phenomenon.

Theorem 4: The mathematical and physical description of the potential energy of interaction, $V(r)$.

Suppose that two particles with different Yin and Yang properties meet. Their potential vectors can be summed along the same direction; the interactional potential energy $V(r)$ is proportional to the product of their mass and inversely proportional to their distance:

$$V(r) \propto x_1 y_2 / r \qquad (4\text{-}3)$$

where x_1 and y_2 are the masses of the two objects and r is the distance between their centers.

Theorem 5: Description of interactional potential/force.

The causality law of Li Yin-Yang reveals that "potential" and "force" form a Yin-Yang pair. Potential is the cause (Yin) and force is the consequence (Yang). The radial variation of the interactional potential energy is the interactional force. The gradient of the interactional potential, $V(r)$, $\Delta V(r)/\Delta r$ (for $\Delta r \to \eta$), is the interactional force between two particles, i.e.,

$$\Delta V(r)/\Delta r = -k x_1 y_2 r^2 \left[i.e. f(r) = -f'(r)\right] \qquad (4\text{-}4)$$

where $f(r) = \Delta V(r)/\Delta r$, $f'(r) = k x_1 y_2 r^2$, and r represents the distance between the two sides of the interaction. The interactional force is greater and steadier when the distance is smaller. This is the most general expression of the interaction between two objects and is a principle applied in Chinese medicine, Chinese herbal medicine, and chemistry. Physics is mostly concerned with the interaction between objects with the same material factors (i.e., $x = y$) and its regularity is expressed in the form of laws.

4.2 The classification and characteristics of Yin and Yang properties

An object's potential energy is related to its spatial location; it is latent energy with Yin and Yang properties. This potential energy exists in the form of a field and has a certain spatial distribution. The level of potential energy is the same and corresponds to the level of space-time. As for the property of Yin and Yang, there is consensus that many manifestations of this property exist in physics, such as positive and negative charges, the N and S poles of magnetic charge, and acids and bases in chemistry. For the sake of consistency, the field theory of physical Yi theory classifies the Yin and Yang property of a potential field (or potential energy) into two types: "type I" is Yang and "type II" is Yin. This is consistent with the Yin and Yang classification of common sense, namely, positive is Yang (I) and negative is Yin (II). There are also so-called neutral substances and neutral molecules, for which different properties of Yin and Yang exist, such as cold (Yin)-hot (Yang) and bitter (Yin)-spicy (Yang) in Chinese herbal medicine. The core of Yi theory is that "one Yin and one Yang is the law". Therefore, it is very important to correctly distinguish Yin and Yang properties, which is not always easy. The classification of Yin-Yang properties is relative. Here, we will use four types of particles—sun, earth, atom, and electron—as representative examples of their Yin-Yang properties.

(1) The earth moves around the sun, and the earth and the sun are considered to be one system; the potential field of the sun is considered to be a type I central potential field, while the potential field of the earth (including its atmosphere) is considered to be a type II central potential field.

(2) The earth's potential field (including its atmosphere), and everything in it, is considered to be one system. The earth's potential field is considered a type II central potential field, while individual objects (such as molecules and atoms) are considered to be type I potential fields.

(3) An atom is often regarded as a miniature equivalent of the Sun and is a type I central potential field, where the nucleus is positive (Yang, +) and the external electrons are negative (Yin, -). This method of classification complies with the above Yin-Yang classification of common sense.

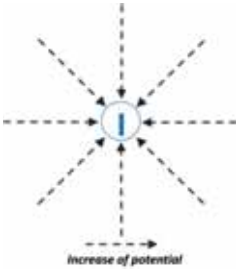


Fig. 4-1. Diagram of type I (Yang/positive) potential vector

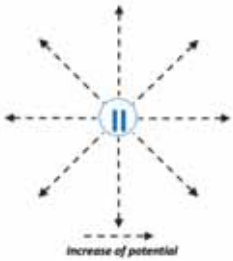


Fig. 4-2. Diagram of type II (Yin/negative) potential vector

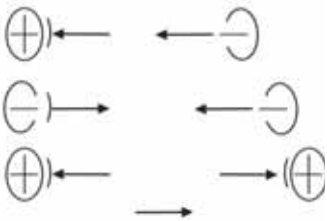


Fig. 4-3. The potential vectors sum up: in the same direction (i.e., reinforce each other) when particles of opposite polarities meet; conversely, the potential vectors point in opposite directions and they are subtracted (i.e., counteract each other) when particles of the same polarity meet

The classification of Yin and Yang is relative; in other words, the degree of Yin and Yang, or positive and negative, respectively, present in one object is defined in relative terms to that of all other objects with the Yin-Yang property. Fig. 4-1 shows the distribution of a particle's potential energy in the central potential field, indicated by potential vectors. It shows the potential of positive polarity (+) and the arrows of the potential vectors point inward to indicate the direction of increasing potential energy. Fig. 4-

2 shows another type (type II) of potential field with negative polarity (-) and the arrows of the potential vectors point outward, in the direction of increasing potential energy. Fig. 4-3 depicts the interaction of two particles with different polarities. These particles can experience such an interaction that their potential vectors are summed up in a linear direction for clarity, i.e., they reinforce each other. In contrast, if two particles with the same polarity interact with each other, their potential-field vectors point in opposite directions and are subtracted, i.e., they counteract each other. As to whether reinforcement or counteraction is better, there is no simple answer because reinforcement/counteraction also constitutes a Yin-Yang pair, which exists independently and is necessary for the energy of universal evolution. Herein, it should be noted that the concepts of the potential vector and the force vector are different but related; however, the potential vector is more fundamental.

The distribution of a potential energy/field has the following characteristics:

1) In a type I potential field (Yang, positive) (with high and low-energy edges), the potential energy gradually increases from the center to the edge and shifts from high to low values towards the low-energy edge of the field. Examples of such fields include the central potential field of the solar system, the central potential field of an atom, a nucleus, positive charges, positive ions, positive particles, alkaline substances, and the north magnetic pole.

2) In a type II potential field (Yin/negative) (with low and high-energy edges), the potential energy gradually extends from the inside to the outside and from low to high values towards the high-energy edge of the field. Examples of such fields include the earth's central potential field, negative charges, electrons, negative ions, negative particles, acidic substances, and the south magnetic pole. Neutral substances, such as those used in Chinese herbal medicine, also have Yin and Yang properties on the molecular level, at varying and different the levels.

Potential, force, and weight: potential and force form one Yin-Yang pair, usually called potential/force. Because potential is implicit and force is explicit, people often feel force while neglecting potential. Force cannot exist independently of potential. As we know, the fact that similar polarities repulse and opposite polarities attract each other is caused by the cross-over interaction between potential and force. In the Yin-Yang relationship between potential and force, the former is Yin and the latter is Yang. Studies of dynamics have focused on the relation between the action of potential and force on an object and the object's motion. What is the relationship between potential, force, and motion? All particles have energy and there is attraction and repulsion between substances on the same level, which interact with each other to reach a general energy balance; moreover, the interactional force has the same amplitude, but an opposite direction along the same straight line—it acts on both objects. However, it generates different effects on the two objects, as the two sides of the interaction have different qualities and characteristics and thus their responses are different. There is also the problem of weight: an object with higher weight can exert some constraints on another with lower weight.

4.3 Derivation of the Liyi equilibrium law

In physics, most relations of interactional potential/force between substances of the same type can be written in the following form:

$$V(r) \propto x_1 x_2 / r \qquad (4\text{-}3')$$

Equation (4-4) can be simplified using the Yin-Yang relationship of interactional potential/force in Li theory:

$$\Delta V(r)/\Delta r = -k x_1 x_2 / r^2 \ \ [i.e., f(r) = -f'(1/r^2)] \qquad (4\text{-}5)$$

where $f(r) = \Delta V(r)/\Delta r$, $f'^{(r)} = -k x_1 x_2 / r^2$, and r represents the distance between the centers of objects in interaction; the smaller the distance, the higher and more stable the interactional force. x can represent a substance on the molecular level, a charge, or a magnetic charge, while k is the dynamic conversion coefficient. Equation (4-5) offers a mathematical

expression of the Yin-Yang-balanced interactional potential/force law in Li theory.

Since both potential and force are vectors, there is the problem of directionality or sign, which is related to selecting the origin in time and space. There is a simple convention for the selection of the spatial origin: generally (but not universally), the side with higher mass is selected as the origin, e.g., the center of the nucleus is selected as the origin for the central potential field of an atom (type I) and the center of the earth is selected as the origin for its central potential field (type II). In this way, there is a convention for the positive and negative signs of Δr, $\Delta r = r_2 - r_1 > 0$, where r_1 is the starting point in space (conversely, if r_2 is the starting point in space, then $\Delta r = r_2 - r_1 < 0$). This convention also applies to the change in time, so that $\Delta t = t_2 - t_1 > 0$, where t_1 is the first point in time. A generally adopted form is $\Delta r > 0$ and $\Delta t > 0$, which complies with the rules of mathematical operations and with human intuition. Correspondingly, the directional relation or positive/negative sign of other physical quantities related to quantities with temporal and spatial variations, such as homeopathy/contrarian and repulsion (force)/attraction (force), becomes clear.

4.4 The LY equilibrium law of interactional potential

The Liyi equilibrium law of interactional potential/force (which is one of the four major supportive mechanical laws of Liyi theory) is the first law derived from basic natural principles/theorems. It plays a critical role in the unified Yi field theory.

4.4.1 The YN equilibrium law of interactional force

The YN equilibrium law of interactional force shows that two types of actions exist—attraction and repulsion—when two objects with different Yin and Yang properties meet. The combined influence of these actions

forms a general equilibrium of energy.

Two important derivative laws are summarized in Table 4-2.

Table 4-2. Two important derivative laws.

1	YN (universal) equilibrium law of interactional force	$\Delta V(r) = -kx_1x_2/r^2(1/r^2)(-\Delta r)$	"Inverse-square law"
2	The spatial rate of variation of the interactional potential is a type of magnetic force.	$\Delta E = (F \cdot v)\Delta t$	Magnetic force (or driving force)

4.4.2 Derivative laws of the LY principle

(1) The force (Yang/divergence) on the right-hand side of equation (4-5) is:

$$f'(r) \propto (k)(x_1x_2)(1/r^2),\ r \to "\eta"(>0)$$
$$f(r) = kx_1x_2/r^2 \qquad (4\text{-}6)$$

Equation (4-6) gives the mathematical expression of the YN (universal) equilibrium law of interactional force, which complies with the inverse-square law and replaces the existing argument of the "universal law of gravity" in empirical, experimental science. Y represents Yi and N represents Newton; η represents an absolute definite value and the smaller this value is, the greater the interactional force.

(2) The mathematical expression of force (Yin/convergence) on the left-hand side of equation (4-5) is:

$$f(r) = \Delta V(r)/\Delta r$$
$$f(r) \propto \Delta V(r)(1/\Delta r)\ \Delta r \to \xi\ (>0) \qquad (4\text{-}7)$$

Equation (4-7) illustrates a new mechanical relation called the interactional potential/force relation, which reveals that the radial rate of variation of the interactional potential energy is a magnetic force (or driving force); ξ represents a certain definite value and the smaller this value is, the larger the interactional magnetic force.

4.4.3 Argument for the "universal law of gravity"

The "law of universal gravitation" (which complies with the inverse-square law) should be replaced by the law of the universal interactional force, which states that the mutual action of attraction and repulsion forms an energy equilibrium and maintains balance/stability. If there is only attraction between things in the universe, there can be no law of relative balance and stability. Regarding Newtonian considerations, the concepts of "universal gravitation", universal gravity, and other formulations are merely "phenomenological descriptions" of the truth of the universe.

4.4.4 Yin Yang interaction force

Another form of force corresponds to the spatial rate of variation of equation (4-7). It is presented in Table 4-3.

Theorem 6: Any subject of dynamics must respect the unity of time and space. Energy in the universe is hierarchical and the energy of time and space is different at different levels of the hierarchy. Furthermore, time and space cannot be discussed without association with mass and energy. There is no single linear association for understanding things in Liyi theory; instead, Liyi understanding undergoes cross-over, motion, and change. Everything has Yin and Yang; a dynamic cross-over relationship connects Yin and Yang and the four quantities of mass, energy, time, and space.

Table 4-3. The Yin-Yang interaction force.

The temporal rate of variation of the momentum of a moving particle is a force	$F = \Delta p/\Delta t = \Delta(mv)/\Delta t$	Newtonian field dynamics
The spatial rate of variation of interactional potential is a type of magnetic force.	$f(r) = \Delta V(r)/\Delta r$	Magnetic force (or driving force)

4.5 Newton's third law reveals that any action is mutual

The mathematical expression is as follows:

$$F_1 = -F_2 \tag{4-8}$$

where $F_1 = k(x_1/r^2)x_2$ and $F_2 = k(x_2/r^2)x_1$ are two forces of the same feature, with the same magnitude and opposite directions exerted linearly on two interacting objects. It yields multiple meanings.

4.5.1 Any action is mutual

The forces of action and reaction are equal in magnitude, but opposite in direction and act linearly on two different objects. The magnitude of the interactional force is proportional to the product of the masses of both interacting objects and is inversely proportional to the square of their distance. Here, *k* is the kinetic parameter. The acting force is mutual, but the individual effects on the two sides of the interaction (two objects) can be different. This is because the factors of mass and substance are different for each side of the interaction. The smaller the distance, the greater and more stable the interactional force. In addition, since the interactional force is bidirectional, if there is attraction there will also be repulsion. The two actions cooperate to achieve energy equilibrium. The interactional force and

the mutual relations of mass, energy, time, and space are used cooperatively to determine the degree of development of this equilibrium.

4.5.2 The non-equilibrium relation of the interactional force

The non-equilibrium relation of the interactional force means that when two sides of the interaction are in a dynamic non-equilibrium state, there are two implications:

- if the distance decreases, the equilibrium relation of the interactional force indicates that two sides of the interaction will approach a relatively stable state of dynamic equilibrium;
- if the distance increases, the system will move further from the equilibrium state, as in decay or explosion.

4.6 Unification of the four major interactional forces

Table 4-4. Three forms of interactional force.

1	Interactional gravitational force	$f'(\mathrm{r}) = GM^{-}m^{+}/r^{2}$	force on the molecular level (long-range force)
2	The interactional electric force between positive and negative charges	$f'(\mathrm{r}) = (1/\varepsilon)q_1^{+}q_2^{-}/r^{2}$	mid to short-range force (Coulomb force)
3	Interactional magnetic force (nuclear force)	$f'(\mathrm{r}) = (1/\mu)Q_1^{+}Q_2^{-}/r^{2}$	short-range force

Empirical science, with a focus on the “unification of the four major interactional forces”, also has to address the problem of the range and

magnitude of the forces. The magnitude and range of the forces form a unity of contradiction (they are reciprocals of each other) alongside the materiality and factors of space-time and the environment for both sides of the interaction. The four major forces commonly recognized in modern physics are: universal gravity; the electromagnetic force; a strong interactional force; and a weak interactional force. Except for the electromagnetic force, the other types of interactional force, such as gravity (i.e., attractive force, referring to the interactional force on the molecular level), electric force, magnetic force, and nuclear force are consistent in form. They obey the inverse-square law with respect to distance, except for any difference in the materiality/quality and the magnitude and range of the force between the two sides of the interaction. The decaying force of weak interaction (decay and aging) can act at both long and short ranges. If mass, electric charge, and magnetic pole are denoted by the symbols m, q, and Q, respectively, the interactional forces have the following three forms (see below).

4.6.1 Gravitational force on the molecular level is a long-range force

The nature of gravity on the molecular level can be considered that of a magnetic force (i.e., a long-range "nuclear force"). Why is this? Everything is composed of molecules, a molecule is composed of atoms, and an atom is composed of electrons and a nucleus. An electron occupies a large space, but its mass is very small. That is, almost the entire mass of everything is concentrated in nuclei exhibiting high magnetism. It is, therefore, evident that everything has a magnetic force.

4.6.2 Interactional force between positive and negative charges

As for the interaction between negatively charged electrons (or electron-like particles) and positively charged nuclei, outside the nucleus,

there are factors of attraction (opposite polarities) and repulsion (same polarities). For the type I central potential field of the atom, the distribution of the potential energy/kinetic energy decreases level by level from the center to the low-energy edge of the field, which also implies that the energy and velocity (or speed) of electrons/particles on marginal levels decrease level by level. An interval of energy is also an interval of time and space, which are the quantities in which repulsion manifests. In some textbooks currently in use, the statement is made that, "by the transition to the inner layers of the atom, electrons emit the excess energy in the form of light", which neither complies with the principles of energy conservation, nor is consistent with the mechanism of optical radiation.

4.6.3 An interactional nuclear force is a short-range force

The interaction between a positron outside a sub-nucleus and the sub-nucleus is the interaction of high-quality magnetic substances with different Yin and Yang properties; opposite polarities attract each other. Moreover, the potential energy/kinetic energy of subatomic positrons on different levels (type I central potential field) decreases level by level from the center. A space-time interval is an interval of energy and there are factors of repulsion. Moreover, the two factors of repulsion and attraction alternately appear, maintaining a state of relative balance and equilibrium. For substances with stronger magnetism, r or Δr is smaller and can even approach zero (but not be equal to zero), and the interactional force is greater.

4.6.4 There is a range of "electromagnetic force"

What type of force is the electromagnetic force? The electromagnetic force does not fit into the usual concepts of interactional forces. The magnetic force and the electric force form a Yin-Yang pair. They are independent and related and, therefore, the interactional force cannot be

discussed without referring to mass-energy and space-time. The equilibrium law of electric-magnetic force/energy is one of the four major supportive laws of Liyi theory, as discussed later in this paper.

4.7 Conversion of thinking and consciousness

The use of mathematical methods to deduce the nature of things and interpret the contradictory and interactional relationship between things is a special and advanced method. It is also the present direction of development in methodology. It is an advanced method because of its carefulness and inclusiveness of interpretation, which transcends the difficulties and limitations of language. It allows the exploration of the law of the existence of matter and the variation of movement and energy with time and space. No particle exists in isolation. Each particle is an indispensable part of a larger space-time system; thus the combined energy of all the constitutive particles is present in this system of time and space. The total energy of the particles is the sum of their kinetic and potential energy. This potential energy is also called the latent energy and the energy of position. In the traditional culture of China, *potential* is the concept of position and is very important. The position is the location and different living forms and different substances have other locations that belong to them.

Life in the universe is complicated and its levels are intertwined with one another. Different levels are connected and interact with each other, which is similar to the correspondence of planets and molecules; for substances on the same level, there are only mutual actions of attraction and repulsion, which correspond to each other to form a general equilibrium of energy. However, any substance that has only a material nature does not have life. Therefore, any substance also has a spiritual nature. Only the unity of spiritual and material properties constitutes a complete object, just as only the unity of thought and substance can constitute a complete life. “Idealism” and “materialism” are determined by positive and negative factors in the

universe, which are necessary conditions for the evolution of energy in the universe. It is not enough to have only substance, but also a spiritual property, which is necessary to determine the manner of motion for the substance; this spiritual property is a manifestation of energy.

Determinism in Western science and philosophy is a theory that considers the causality, regularity, and necessity of objects. Determinism states that there is a universal objective law and relationship of causality in the natural and human world. Any consequence can be attributed to a certain prior cause, or possible future events can be predicted based on their predecessors. Scientists have realized that everything in the world around us is precise and ordered. Einstein's outlook on the world is representative of consistent determinism. He believed that human thoughts, feelings, and actions are not free and obey a certain rule of causality, just like stars in the heavens. The rationality derived from those mentioned above—Three Thinking—must contain two aspects. The first is the clarity of its mathematical derivation. Another is an axiom linked to the physical reality that everyone can experience. The self-consistency of mathematical interpretation is that, for a given mathematical system, the given prerequisite can only yield one result in compliance with causality. The second consistency requirement is that everyone must experience a theoretical result, and it is not acceptable if this is not true.

4.8 Instinct to maintain the stability of energy balance

Everything has an instinct to maintain the stability of its energy balance and will consciously or unconsciously seek to gain or release energy. The harmonious and ordered universe is conditional and sets standards for all beings in it. They need to correctly understand the law of evolution and the development of things, and behave according to its operational principles. Any form of thinking that does not follow the law of change and the development of things will be impacted by powerful natural forces in the

universe, or even destroyed.

4.8.1 Expanding with heat and contracting with cold

Every object has the instinct to maintain the equilibrium and stability of its energy. Expanding with heat and contracting with cold are ideal manifestations of how an object tries to satisfy this instinct. Among all things in the universe, the causality between things is relatively easy to understand, for example, metal expansion with heat and contraction with cold where cold and heat are the causes. This contraction or expansion is the consequence of the attempt to achieve equilibrium and stability of energy. The physical property of the expansion with heat and the contraction with cold is a pair of opposing processes, analogous to attraction and repulsion, which seeks equilibrium because of some energy non-equilibria. In the case of expansion with heat, heat is the cause and expansion is the consequence. Due to excessive energy, a substance must release some energy by increasing its spatial dimensions and the distance between particles inside the substance becomes larger, i.e., $r \to r + \delta$. Therefore, the interactional force becomes smaller, $\propto 1/(r+\delta)^2$. The substance thus releases some energy to achieve a new equilibrium—this process is called heat expansion. In contraction with cold, the distance between the particles is reduced to obtain energy from the exterior and increase the substance's cohesion. Renewal and metabolism can also be interpreted similarly. This description refers to the normal situation (there are exceptions).

4.8.2 Similar polarities repulse and different polarities attract each other

Different charges attract each other and their potential vectors lie in the same direction. Thus, they reinforce each other, increasing the interactional force (a small equilibrium distance is called attraction). The potential vectors of the same charges lie in opposite directions and they repulse each

other, so that the interactional force decreases (a large equilibrium distance is called repulsion). Each object has its field range, which is determined by the mutual constraints of the particular mass/energy/time and space. Therefore, opposite charges attract and repulse (impenetrability) and similar polarities repulse and attract. The phenomena of repulsion and attraction balance each other out to reach a general energy equilibrium, although the degree of stability is different for different systems. Upon reaching equilibrium, the interactional forces are equal in magnitude, opposite in direction, and obey the inverse-square law. This indicates that the interactional force is greater and more stable when the distance between charges with opposite polarities is smaller. For the same polarity, the interactional force is weak, and the distance is large, leading to a meta-stable state.

For example, Fig. 4-4 illustrates the structure of water ice molecules: the length of the H-O bond (the attraction between opposite polarities) is 0.1 nm and that of the H-H bond is 0.3 nm (the repulsion/attraction of similar polarities); the former is an intramolecular bond and the latter is an intermolecular bond. The interactional force is greater and more stable when the length of the bond is shorter and vice versa. We are all familiar with the basic physical phenomenon that "*Similar polarities repulse each other, and opposite polarities attract each other*". However, *theoretical study demonstrates that there can be a phenomenon of "attraction" in a relatively stable state under the appropriate conditions between two objects that carry charges of the same polarity*. The potential vectors of two charges with the same polarity lie in opposite directions. The potential energy is partially counteracted to eventually reach equilibrium, forming a meta-stable state; this is why the hydrogen bond is often longer than regular chemical bonds.

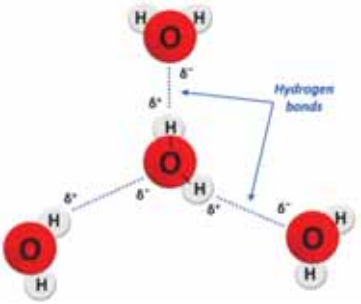


Fig. 4-4. Water ice molecules. The H-O bond is 0.1 nm in length (like), and the H-H bond is 0.3 nm in length (unlike); the molecule has a tetrahedral configuration with a bond angle of 109.4°

Fig. 4-5. Water knows the answer

4.8.3 Consciousness determines and changes the substance

Studies conducted by the American scientist Backster have confirmed that human behavior can affect the emotions (i.e., pleasure, anger, sorrow, and joy) of plants. In the past ten years, the results of water crystallization experiments in Japan (3) have shocked the world. “The water crystallization experiment for the vibration of energy thoughts” impressed the United Nations and its ideas were the inspiration for a must-see movie. These experimental results are consistent with the results of Liyi theory and quantum physics. *Liyi theory also reminds us that the ideas and practices of humans affect the surrounding world all the time. Human beings and everything that exists constitute an indivisible whole.* Water is like a mirror (see Fig. 4-5) and faithfully reflects human influence and everything in the surrounding environment. Matter and consciousness are inseparable and the consciousness of human beings can affect and alter the surrounding material world. Every thought will affect both us and our ambient environment and

thus it is very important to maintain good thoughts. We need to get rid of bad thoughts, place strict demands on ourselves, and learn how to live a kinder life to purify the environment and maintain world peace; this is also the way of life taught by ancient sages. On the other hand, the human body contains 70-90 % water, and only a pure mind has pure water—water cannot be permanently changed if the human mind does not change. Social problems can only be fundamentally solved if people perform good deeds and morality recovers. The question of how to solve such problems is truly a profound and broad subject: it is the question of how to purify the mind.

Traditional Chinese Yin-Yang and five-element theory has profound meaning. We can consider the possibility of mathematics from the perspective of modern philosophy and logic and the occurrence and development of Yi theory from a perspective that is more general and closer to the essence of life. From the perspective of the "science of life" and the "science of physics" in China's ancient philosophy, one should look inward and remedy one's own mind when encountering problems and difficulties. The science of Liyi theory will become the foundation for the future culture of life and practice, forming an overall comprehensive concept of culture for understanding space-time, life, the universe, the human body, and society, and contributing to the improvement and nobility of human life and modes of living.

The dynamics of Liyi teach us how to study the relationship between matter, motion, force, and energy, and their conservation/balance laws. The field theory of physical Yi theory incorporates the concept of Yin-Yang and quaternity in Li theory with the field theory of modern Western science. It includes several basic principles and laws of dynamics. It can effectively connect the core elements of existing electromagnetic theory, relativity, quantum theory, and Newtonian mechanics with logical consistency to create a completely new theoretical system. Liyi theory has three aspects of cognitive methodology:

1) *philosophy*: no matter how large the universe is, it is undoubtedly a symmetrical, harmonious, and ordered system;

2) *faith*: a real science should be understandable by most people at different levels, regardless of their educational background;

3) *guideline*: we can only find the nature of things and the correct answer by starting from the content and connections of things themselves.

CHAPTER 5

THE UNIFICATION OF GRAVITY AND ELECTROMAGNETIC FORCE AS DEDUCED BY THE YN LAW FROM LIYI THEORY

Abstract: The "unification of gravity and electromagnetic force" is an idea envisioned by Albert Einstein, who tried to achieve this goal up to the end of his life. This has also been an ultimate goal of the so-called *unified field theory* of modern empirical science over the course of the past century; however, this has not yet been achieved. The fundamental reason is that studies of this phenomenon rely on gravitational field theory, which lacks Yin and Yang symmetry. As such, it cannot unify the electromagnetic force, which has high symmetry. The field theory of physical Yi theory, referred to as Liyi theory, can resolve this long-lasting scientific problem because it is based on the correct methodology of cognition and the four principles/laws of dynamics. The earth moves around the sun and itself rotates. Furthermore, people and everything else move around the sun along with the earth. Why do people, houses, and particles in the air seem to stay firmly in place rather than seem to be thrown about? This cannot be explained by the modern "theory of universal gravitation", which claims that the attractive force of the earth's core attracts everything. To solve for the regularity of any individual particle that moves around an axis in a geo-

potential field, we must solve several problems: 1) find the symmetry of the gravitational field; 2) the rotary mechanism; 3) the source of rotary power; and 4), we must define differential equations for the dynamic-equilibrium interactional force/motion.

5.1 Dynamics of the earth's (type II) central potential field

The four primary elements—substance, energy, space, and time—constitute everything in the universe. Everything itself is the material and the field, and the field is the real form of the existence of everything, invisible and untouchable.

5.1.1 The manifestation of field-particle duality

The principle of Li Yin-Yang quaternity reveals the mathematical and physical relationships between mass, momentum, energy, and velocity (namely, the space/time ratio):

$$E = mv^2,\ \ p = mv,\ \ v = D/T \qquad (5\text{-}1)$$

All four images of mass, energy, time, and space contain the concept of the field. We usually refer to the matter field, the energy field, the time field, and space. All substances have a potential field and Yin-Yang properties. Potential energy is related to a position and the properties of the potential field represent properties of the matter field.

Previous work suggests that the law of the equilibrium of interactional potential/force reveals that "potential" and "force" make a single pair of Yin and Yang. The potential, as a cause (Yin), is in the first place, and the force, as Yang, is in the second place. The radial variation rate of interactional potential energy is the interactional force and the gradient of the potential vector $V(r)$, $\Delta V(r)/\Delta r$, gives the interactional force as follows:

$$V(r)/\Delta r = -GMm/r^2 \left[\text{i.e.}, f(r) = -f'(r)\right] \qquad (5\text{-}2)$$

where $\Delta r \to \eta$ and η denotes a spatial variable that approaches zero as a

limit. $f(r) = \Delta V(r)/\Delta r$, $f'(r) = GMm/r^2$, where M indicates the mass of the potential field of the earth; m denotes the mass of any object in motion; r is the distance between the centers of both objects; and G is the conversion coefficient. It should be noted that the term $f'(r) = GMm/r^2$ on the right side of equation (5-2) corresponds to the interactional force, which obeys the inverse square law of distance and is general in nature; the universal interactional force replaces the concept of "universal gravity".

5.1.2 Space-time duality

Time and space make a single pair of fundamental concepts that people use to describe the movement of a substance. They must retain independence (duality) and consistency (relevance) in the form of thinking and are naturally reflected in the mathematical and physical analytical expressions that describe the law of movement of matter without any artificial assumptions. The particle is not isolated and is also an indispensable part of its space-time system, (t, r). This concept sees the unification of field-particles in time and space, embodied in two aspects—velocity and energy. Velocity is an intrinsic physical quantity of moving objects and it is also a component of their environment, (t, r). Time and space are connected as follows:

$$v(t,\ r) = \Delta r/\Delta t = D/T \qquad (5\text{-}3)$$

which is described as the relativistic metric of space and time. The velocity of moving objects is a vector and its magnitude is equal to the intrinsic velocity of moving objects. This is a unique point of Liyi theory that is different to the current theory of relativity.

Furthermore, we can derive the principle of energy conservation in the universe (also called the kinetic energy theorem) according to the principle of energy conservation:

$$V(r) = \Delta E_k,\ \ (\Delta E_k > 0) \qquad (5\text{-}4)$$

where $E_k = 1/2mv^2$ is kinetic energy and $V(r)$ is interactional potential energy. These concepts will be used in the following derivation.

5.1.3 The rotary mechanism of rotary dynamics

Rotary motion exists in the ubiquitous form of objects in the universe: galaxies revolve around the core of the universe; stars revolve around the centers of galaxies; planets revolve around stars; satellites revolve around planets; and electrons revolve around atomic nuclei. Rotary motion is the basic type of motion for objects in the universe to keep their overall dynamic equilibrium and harmony. The earth moves around the sun and the earth rotates as well. The earth (including its atmosphere) belongs to a type-II central potential field, in which the energy is higher in its exterior and lower on its surface; any individual particles within the range of earth's potential field are subject to the constraints of its overall potential field and interact with each other.

Because of the earth's rotation, any moving particle (with mass m) in its potential field moves circularly around an axis, as shown in Fig. 5-1. The theories of dynamics and Newtonian mechanics of the central potential field are combined to formulate a dynamic system with Yin-Yang symmetry. The direction of motion (v) in a uniform circular motion is the tangential direction of the circle (track) and this "tangent line" is exactly perpendicular to the two forces that are in equilibrium. The two acting forces of different properties are equal in magnitude and opposite in direction; they act on the same object along the same straight line. Hence, the object moves uniformly and circularly around a center (such as the earth's axis). The equations of motion are established on this basis. The mathematical relationship between momentum conservation and field momentum conservation is given below.

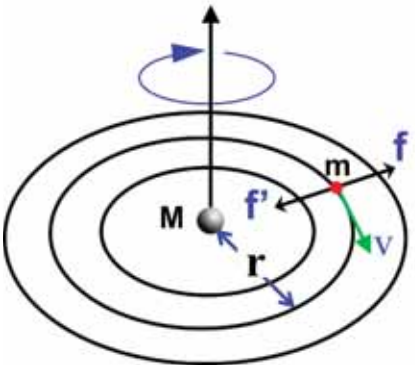


Fig. 5-1. A rotary dynamic relationship in the central potential field of the Earth (II), $m \ll \mathrm{M}$, $\langle m \rangle \in \langle M|m \rangle$.

There is a concept of conservation of momentum in current science, but there is no concept of the conservation of field momentum. Here, we present a brief description of this concept.

5.1.4 The conservation of field momentum

First, we describe the conservation of momentum. According to the dynamic relationship of Newton's field, $F = \Delta p/\Delta t = 0 \rightarrow \Delta p = 0$, $1/\Delta t \neq 0$, when $\Delta t = t_2 - t_1 \neq 0$, $p = const.$

$$F = \Delta p/\Delta t = 0 \rightarrow \Delta p/\Delta t = \Delta(mv)/\Delta t = m\Delta v/\Delta t + v\Delta m/\Delta t = 0$$

$$m\Delta v + v\Delta m = 0,\ 1/\Delta \mathrm{t} \neq 0;\ \rightarrow m\Delta v = -v\Delta m,\ 1/\Delta \mathrm{t} \neq 0$$

Simply speaking, the conservation of momentum is a prerequisite for the conservation of field momentum. As shown in Fig. 5-1, we can select any moving object (m) and the potential field of the earth (M) as a binary subsystem; the field momentum of this system is conserved as follows:

$\sum = \Delta(Mv')/\Delta t + \Delta(mv/\Delta t) = 0$ and if $\Delta(Mv')/\Delta t = 0$ (prerequisite), $\Delta(mv/\Delta t) = 0$, being simplified as conservation of momentum and field momentum for moving objects.

Boundary conditions. The equation of circular motion can be solved using (simplified) differential equations of field momentum conservation by the derivative/integral method. In this process, we need to select the ground as an equipotential surface for the reference plane, where the surface velocity of moving objects is $v = 0$, potential energy is $V(R) = 0$, and R is the earth's radius; we also need to select the "origin" of time.

5.2 The principle of momentum and field momentum conservation

5.2.1 The principle of Li Yin-Yang (field) momentum conservation

Liyi theory has three aspects of cognitive methodology:

1) *Philosophy*: no matter how large the universe is, it is definitely a symmetrical, harmonious, and ordered system.

2) *Faith*: a real science should be understandable by most people to varying degrees, regardless of their educational background.

3) *Guideline*: we can find the nature of things and the correct answer only by starting from the content and connections of things themselves.

Table 5-1. The principle of Li Yin-Yang (field) momentum conservation.

Origin	Newton's field dynamic relationship; the temporal variation rate of momentum is force, $F = \Delta p/\Delta t$.
Principle of momentum/field momentum conservation	If a system does not experience an external force or the vector sum of experienced forces is zero, this system's total momentum remains unchanged. This system's field momentum is conserved, and this relationship further evolves into the relationship of equilibrium acting force.
Yi theory is based on simplicity	The simplest approach is to use a binary observation system by avoiding complexity without losing the principles, and there is the characteristic of connecting time and space.

5.2.2 The principle of field momentum conservation

Theorem 1: The selection of binary subsystems should follow four principles: Yin, Yang, dynamic, and static. To establish the differential equations for an equilibrium acting force/motion, we select a binary subsystem. Fig. 5-2 shows a motion-static binary system. For the static principle, the mass of the central potential field of the earth (including its atmosphere) is M and the velocity is v'. For the dynamic principle, the mass of any physical particle (called a moving object) in the potential field is m and the velocity is v.

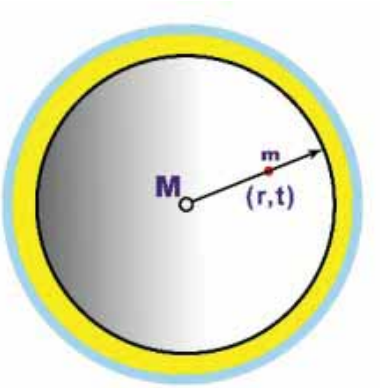


Fig. 5-2. The basic element of Yin-Yang and the dynamic-static principle for the binary system

Momentum is the product of mass and velocity. The system must satisfy certain conditions to maintain conservation of field momentum without the action of an external force. The mass of the static component needs to be very large compared to that of the dynamic component and can be considered motionless; in other words, the momentum and temporal rate of variation of the momentum of the static component are so small that they can be considered negligible. Therefore, the binary problem can be simplified as a unitary problem.

Table 5-2. Selection of the binary subsystem.

	Binary subsystem $\langle m\rangle \in \langle M\vert m\rangle$	quality	velocity	momentum
1	gravitational potential field (Yin/static)	M	v'	Mv'
2	any particle in the potential field ((Yang/dynamic)	$m(>0)$	$v(\geq 0)$	mv
3	$v' \approx 0,\ v \geq 0;\ m \ll M$			

Theorem 2: The interpretation of field momentum conservation with momentum conservation includes three aspects:

(1) Field momentum conservation of binary subsystems: $\Delta(Mv'/\Delta t + \Delta p/\Delta t) = 0$; if $\Delta(Mv')/\Delta t = 0,\ \Delta p/\Delta t = 0$.

(2) Simplified as momentum conservation and field momentum conservation of moving objects: $\Delta p/\Delta t = 0$.

(3) Interpretation of the relationship of an equilibrium acting force with field momentum conservation: $\Delta p/\Delta t = \Delta(mv)/\Delta t = m\Delta v/\Delta t + v\Delta m/\Delta t = 0$.

According to Newton's relationship of field dynamics, the temporal variation rate of momentum is force. If the system can maintain dynamic equilibrium and a harmonious state without the action of an external force, the force required to drive and sustain the movement of a moving object must originate from the system's interior. Thus, if the field momentum of the static component is conserved (which is a prerequisite), it can be simplified as the momentum conservation and field momentum conservation of moving objects, $\Delta p/\Delta t = 0$.

Theorem 3: The mathematical expression for the interpretation of the relationship of an equilibrium acting force with the field momentum

conservation of moving objects is $\Delta p/\Delta t = \Delta(mv)/\Delta t = m\Delta v/\Delta t + v\Delta m/\Delta t = 0 \rightarrow f + f' = 0$.

Theorem 3′: The following derivation uses the fact that the static component maintains the conservation of field momentum, $\Delta(Mv'/\Delta t) = 0$, as the prerequisite, which needs validation. The configuration of boundary conditions needs to be justified, which has two requirements: (i) it must not contradict other relevant theories; (ii) it must agree with the universe's regulatory principles.

5.3 The YN equilibrium acting force

5.3.1 Solution of the differential equations for the motion of moving particles

Following Theorem 3, we interpret the relationship of an equilibrium acting force with field momentum conservation and further expand it as follows:

$$\Delta p/\Delta t = \Delta(mv)/\Delta t = m\Delta v/\Delta t + v\Delta m/\Delta t = f + f' = 0 \quad (5\text{-}5)$$

This is a critical step. Thus, we can derive the relationship of equilibrium acting force as:

$$m\Delta v/\Delta t = -v\Delta m/\Delta t,\ f = -f'\ (\Delta m \leq 0) \quad (5\text{-}5')$$

where $f = m\Delta v/\Delta t$ and $f' = v\Delta m/\Delta t$. f and f' denote two forces with different properties, which are equal in magnitude and act in opposite directions on the same object (m). Equation (5-5′) is very important.

5.3.2 Establishing equations of motion

According to Newton's second law of motion, a moving object (m) is accelerated under the action of an external force. The mathematical relationship on the left side of equation (5-5′) should be:

$$f = m\Delta v/\Delta t = ma \quad (5\text{-}6)$$

where acceleration a is equal to $\Delta v/\Delta t$.

It should be noted that force is key to the interaction of two objects. Causality is revealed in the fact that the motion of any object needs the action of energy and force. Moreover, such a force has two sides: one is the factor in the object itself, while the second is a consequence of interactions between other objects. As such, we must directly discover the law of variations in individual physical quantities to solve the differential equation (5-5′). (Theorem 4: Life needs positive energy.)

5.3.3 The partial differential equation of time

As for the system under discussion, if $\Delta v/\Delta t \neq 0$, $\Delta m/\Delta t \neq 0$, and $1/\Delta t \neq 0$, then we can separate the time factor, $1/\Delta t$, in equation (5-5′) and derive the following partial differential equation:

$$m\Delta v = -v\Delta m > 0\ (\Delta m \leq 0) \qquad (5\text{-}7)$$

where Δv and Δm are the derivatives of velocity (v) and mass (m) of moving objects relative to time, respectively. In the following, we will adopt the relativistic method of Feynman's physics. We multiply both sides with $v/2$ to change it into another form on the left side, m remains unchanged, but v is variable; on the right side, v remains unchanged, whereas m can change, and $\Delta m \leq 0$:

multiplication of the left side by $v/2$: $v/2m\Delta v \rightarrow \Delta(mv^2)$;

multiplication of the right side by $v/2$:

$$v/2(-v\Delta m) \rightarrow \Delta(1/2mv^2) = \Delta E_k \geq 0 \qquad (5\text{-}7')$$

Therefore, only if $\Delta m \leq 0$, the left sides of equations (5-7′) and (5-7) are positive and the following derivation can be implemented. Furthermore, in equation (5-7′), $E_k = 1/2mv^2$, representing the kinetic energy of moving objects and $\Delta E_k \geq 0$ (*special note*: the temporal variation rate of kinetic energy is always positive, determined by $\Delta m \leq 0$. Theorem 5: "No loss, no gain", as a law of the universe is certified here). We substitute both the left and right sides back into equation (5-7) and the expression becomes the full differential with respect to time:

$$\Delta(mv^2) = \Delta E_k \tag{5-8}$$

In particular, this differential equation cannot be solved directly (Theorem 6: Any dynamic law must be a space-time unity), therefore, it must be combined with the force related to the spatial variation rate to find the law (i.e., "one Yin and one Yang is the rule"). According to the energy conservation of the universe in equation (5-4), $\Delta V(r) = \Delta E_k$, we convert the variation of kinetic energy ($\Delta E_k \geq 0$) in equation (5-8) to the variation of interactional potential energy with respect to space $\Delta V(r)$:

$$\Delta(mv^2) = \Delta V(r) \geq 0 \tag{5-9}$$

This is the full differential expression of the function of state for the type-II central potential field of the earth, achieving space-time unity.

5.3.4 Solution for the original function with the full differential equation

The space-time conversion of the law of motion. We have solved the interactional potential function from the full differential equation (5-9). Developing the mathematics, if derivatives of two physical quantities are equal, these two quantities are different by, at most, a constant, c_1. If we perform the integration of both sides of the equation:

$$mv^2 = V(r) + c_1 \tag{5-10}$$

which holds for all velocities. How does one select the boundary condition? This question is also very important.

We solve the equation for circular motion from the differential equation of field momentum conservation through the integral method. In this process, we must set the value of the earth's equipotential surface to zero as the reference plane: if the velocity of a moving object is $v = 0$, the interactional potential energy is $V(R) = 0$, where $r = R$ denotes the radius of earth. As such, we derive $c_1 = 0$ and obtain the interactional potential function between moving objects and the type-II central potential field of the earth:

$$V(r) = -GMm/r \tag{5-11}$$

where M is the mass of earth's potential field (including the atmosphere); m is the mass of any moving object in the potential field; and G is the conversion coefficient. The negative reciprocal factor, $-1/r$, in equation (5-11) indicates that the characteristic energy of the earth's central potential field increases as r increases.

This confirms the main features of the type-II central potential field of Earth and indicates that the interactional potential energy between the object (m) and the earth has a negative value. We can introduce the potential function $V(r)$ into equation (5-10) and derive an important relationship of the potential function as follows:

$$mv^2 = -GMm/r \tag{5-12}$$

which is the state function for the type-II central potential field of the earth. This equation indicates that at location r in Earth's central potential field, the energy $(E = mv^2)$ of any moving object with mass m is equivalent to the potential energy of its location, where m, v, and r are all independent variables that are related.

5.3.5 Solution for the equation of uniform circular motion

We divide both sides of equation (5-12) by r $(r > 0)$ to derive the equation for the uniform circular motion of moving objects around Earth's axis:

$$mv^2/r = -GMm/r^2 \ (i.e. f_{YN} = -f_{YN}^{'}) \tag{5-13}$$

where $f_{YN} = GMm/r^2$ and $f_{YN}^{'} = GMm/r^2$. We further derive the relationship of an equilibrium acting force:

$$mv^2/r + GMm/r^2 = 0 \tag{5-14}$$

Here, equations (5-13) and (5-14) are two important equations for equilibrating uniform circular motion in the gravitational field. Here, the so-

called equilibrating force is the balance between the centrifugal and centripetal forces, i.e., $f_{YN} = -f_{YN}^{'}$. Obviously, f_{YN} and $f_{YN}^{'}$ have different natures: the former is the centrifugal force, while the latter is the centripetal force. They are equal in magnitude and opposite in direction along the same straight line, and they act on the same moving object (m). Therefore, the object moves uniformly around the axis of the potential field at a constant speed (v).

By combining equations (5-13) and (5-5′), and referring to Newton's theory of mechanics, we can write the left side of the equation of circular motion as:

$$f_{YN} = m\Delta v/\Delta t = ma = mv^2/r, a = \Delta v/\Delta t = v^2/r \ (\Delta v > 0) \quad (5\text{-}15)$$

where a is centrifugal acceleration (with direction pointing away from the center of Earth); the right side of equation (5-13) is the driving force of the circular motion of the moving object (i.e., "external force"), whose direction points towards the center of Earth and is also called the centripetal force:

$$f_{YN}^{'} = v\Delta m/\Delta t = GMm/r^2 = mg, \ g = GM/r^2 \ (\Delta m \leq 0) \quad (5\text{-}16)$$

combined, these two equations yield:

$$g = -a = -\Delta v/\Delta t, \ G = -(r^2/M)\Delta v/\Delta t = (r^2/M)g \quad (5\text{-}13')$$

where g is the centripetal acceleration (with direction towards the center of the Earth). As for the gravitational field of the earth, centrifugal acceleration, a, and centripetal acceleration, g, are equal in magnitude, but opposite in direction. Therefore, equation (5-13) is the YN equation of uniform circular motion. Here, Y means Yi (pronounced "yi") and N means Newton. Given this equation's richness and other relationships, it is also called the YN law of uniform circular motion (in a gravitational field).

5.4 Inference and deduction

The self-rotation mechanism of Earth is similar to that of a giant centrifuge. A centrifuge rotates at high speed around its axis and the medium inside has a certain gradient distribution according to the size of the particles involved. Small particles move up, while large particles move down to maintain a dynamic and non-uniform, but ordered distribution. Earth revolves periodically around the sun and also rotates periodically by itself. If we imagine the self-rotation of the earth's potential field (including its atmosphere) as a large centrifugal machine, then its high-speed rotation around an axis drives the entire potential field into forming a strong gradient in the potential field. The potential energy is high at the end, far away from the center, and is low at the ground surface near the axis, resulting in a non-uniform, but ordered distribution of substances inside. Small particles with high energy move up, while coarse particles with large densities move down, thus maintaining the overall dynamic equilibrium and harmony. This is the salient feature of the self-rotation of the earth.

5.4.1 The dynamic equations of the gravity potential field

The dynamic equations of the gravity potential field are summarized in Table 5-3.

Table 5-3. The dynamic equations of the gravity potential field.

1	Potential energy	$U(r) \propto m/r$	Dual observation
2	Dynamic and static interaction potential	$V(r) = -GMm/r$	system: $\langle m \rangle \in \langle M \vert m \rangle$, $m \ll M$; $\Delta v \propto \Delta V(r)$
3	Time-space rate of particles	$v = D/T \propto 1/r$	
4	interaction potential/force conservation/law of equilibrium	$\Delta V(r)\Delta r = -GMm/r^2$ $[i.e. f(r) = -f'(r)]$	$f'(r) = GMm/r^2$;
5	YN uniform circular motion	$mv^2/r = -GMm/r^2$ $[i.e. f = -f']$ Vector equation.	

5.4.2 Unification of gravity and the electromagnetic force

The mathematical expression for YN (field of gravity) balanced force-uniform circular motion can be given as:

$$mv^2/r = -GMm/r^2, f = mv^2/r,\ f'(r) = GMm/r^2 \text{(5-13′)}$$

According to the law of (uniform) circular motion in the gravitational field, the object moves uniformly along a circle under the action of two equilibrium forces that are equal in magnitude, but have opposite directions. This movement is rotary and thus has three main features:

(1) There are two different types of force. One of them is centrifugal force f_{YN} (called the electric force) and the other is centripetal force f'_{YN} (gravity is a magnetic field). These two forces are equal in magnitude and opposite in direction, but act on the same object (m), as shown in Fig. 5-3. The object moves in a circular fashion with energy $f_{YN} = mv^2/r$ (called electric energy) and its direction of motion (v) is perpendicular to the

equilibrium electromagnetic force.

(2) The characteristics of direction and distribution of longitudinal (magnetic), latitudinal (electric), vertical, and horizontal circulations are shown in Fig. 5-4. In the vertical direction, the longitudinal magnetic energy is perpendicular to the equilibrating force and sees semi-circular circulation along the longitudinal line. In the horizontal direction, the latitudinal electric energy is perpendicular to the equilibrium acting force and forms transverse circular circulation around the center. As such, the central potential of the earth (including the atmosphere) forms a longitudinal-latitudinal magnetic, electric structure.

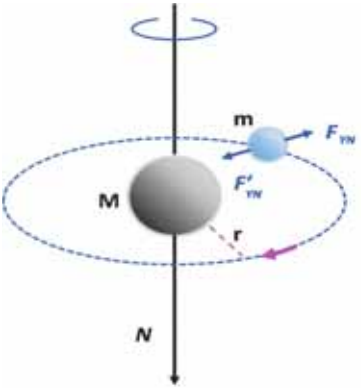


Fig. 5-3. Direction and distribution of latitudinal (electric) horizontal circulation around the core

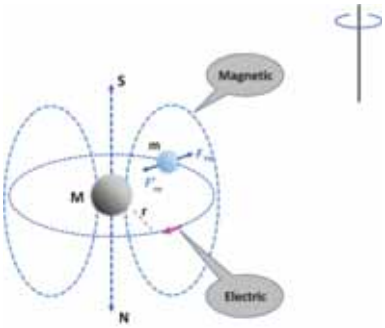


Fig. 5-4. Direction and distribution of longitudinal (magnetic) vertical semi-circular circulation through the core

(3) The horizontal centrifugal force f_{YN} and the tangential direction of the circular motion of moving objects (the direction of the earth's self-rotation) constitute a right-handed coordinate system with the thumb pointing towards the magnetic north pole of the earth's axis. Fig. 5-5 illustrates the self-rotation of the earth from west to east (right-handed screw law) and the distribution of magnetic field lines.

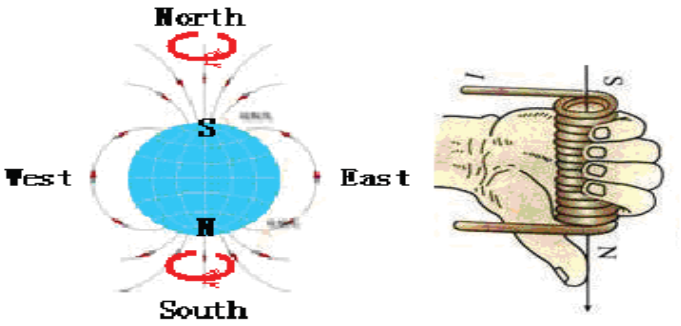


Fig. 5-5. Orientation and distribution of electromagnetic force lines in the type-II central potential field of the earth and its self-rotation (from west to east).

5.5 Connotation of physical laws

It has been a long-cherished scientific dream (e.g., of Newton and Einstein) to achieve the unification of gravity and the electromagnetic force. The key lies in finding a theory and approach that can interpret the law of uniform circular motion by combining the momentum conservation and field momentum conservation of moving objects. Here, we only present the fundamental part of the physical theory, as the relevant principles and equations are beyond the scope of this book. Table 5-4 contains three important relationships and laws.

Table 5-4. Three important relationships and laws.

⊙	Law of "no loss, no gain"	$\Delta m \leq 0$, $\Delta E_k \geq 0$; (5-7')	"bottleneck", absolute
⊙	Law of energy conservation in the universe	$\Delta V(r) = \Delta E_k$; (5-4)	From the principle of energy conservation (one of them)
⊙	Law of magnetic-electric differential equilibrium	$\Delta(mv^2) = \Delta V(r)$;（5-9）	(unity of time-space, full differential)

Here, the three rules are keys to field theory because they all originate from the theory on a causal relationship. First, for the rule of "no loss, no gain", to confirm Newton's second law represented by equation (5-7), we must combine two inequalities, $\Delta m \leq 0$, $\Delta E_k \geq 0$, which are called the "bottleneck" and are very strict. The meaning of these inequalities is that the *previous life* of substances must be lost to increase kinetic energy. Kinetic energy is the energy necessary for life and life can be renewed only if kinetic energy increases (other rules follow). Second, the interactional potential energy (on which life relies) has to increase, $\Delta V(r) = \Delta E_k$, which is called the "law of energy conservation in the universe" (this law originates from the principle of energy conservation and is universal). Third, there is, therefore, the differential law of magnetic-electric equilibrium, $\Delta(mv^2) = \Delta V(r)$. This full differential equation considers the unity of time and space as the key to solving the law of dynamics by using mathematical analysis. What life needs is high-energy electromagnetic matter.

In the solution of the time factor, we adopt a calculus method to solve the original function with derivatives. In this process, except for the careful selection of the spatial integral parameter, we need to recover the separated

time factor. According to the requirement of Theorem 3, the derivation results—namely, whether the set prerequisite is satisfied—must be validated. There are two requirements: (i) the results cannot contradict other relevant theories and (ii) the results need to agree with the regulatory system of the universe. The problems concerning the time factor, or the time period, are profound and beyond the scope of this book.

The universe has entered a particularly critical period in its history. It has been documented in historical prophecies that the celestial body will be reorganized and the universe will be updated in this period. Now is the time for the rectification of the universe. First, the universe will accelerate its expansion. Second, the original universe will experience a certain kind of metabolism. The old galaxies will collapse and new galaxies, stars, and planets will form. Meanwhile, all the old corrupt and decadent ideas will be purified in the civilized society of the universe and humankind will enter a beautiful era.

5.6 "Haze scattered" over the gravitational field

Earth is a very special planet. The gravitational potential field is V-shaped on its surface. To expand, more than 7 billion people live on Earth's surface, like at the bottom of a pot, where the potential energy is low and the particle is large. The load that humans are subjected to is high and the human instinct is concealed so that we cannot see the truth of the universe. This is what is meant by the phrase "*it is difficult to go to heaven, as well as to go to hell*". This will be different if we know the appropriate rule. We know that the rule "*apples fall to the ground*" is not caused by the center of the earth's attractive force, as it does not comply with the high-level criteria necessary. Knowing this rule can change our thinking.

▲1. *Nonlinear distribution of substances in a gravitational field with height*. Time and space, in general, are composed of substances and different times and spaces are composed of different substances. The

universal mass-velocity-energy relationship, $m^2c^2 = m^2v^2 + m_0^2c^2$, reveals that a substance is nonlinearly distributed with velocity. The lower the velocity, the larger the static mass (m_0), but the smaller the dynamic mass (m), and vice versa. The velocity of substances in Earth's potential field is much lower than the speed of light and these substances are nonlinearly distributed in terms of velocity (i.e., height). In the mass-velocity-energy relationship, we keep c and m_0 constant and calculate the partial differential of m with respect to v:

$$\Delta m = \Delta v m v/(c^2 - v^2) \rightarrow \Delta m \propto \Delta v \qquad (5\text{-}17)$$

indicating that the dynamic mass increases as the velocity increases, i.e., $\Delta v \propto V(r)$. If we keep m unchanged and calculate the partial differential of m_0 with respect to v,

$$\Delta m_0 = -\Delta v v m^2/(m_0c^2) \rightarrow \Delta m_0 \propto -\Delta v \qquad (5\text{-}18)$$

then, if velocity decreases, the static mass increases and the dynamic mass decreases.

▲2. The microgravity effect of a gravitational field: f' on the right side of equation (5-13) of circular motion denotes the magnetic force, which evolves into,

$$f' = m(GM/r^2) = mg,\ g = GM/r^2,\ r = R + h \qquad (5\text{-}19)$$

The magnetic force is gravity (i.e., an attractive force), which we usually refer to and which points to the center of the earth. The magnitude is equal to the product of the mass and acceleration of the object. The acceleration is inversely proportional to the square of the radius of the potential field ($g \propto 1/r^2$):

$$f' \propto m/(R + h)^2 \qquad (5\text{-}20)$$

Therefore, the microgravity effect of a gravitational field is reflected in two aspects:

(i) the larger the radius of the potential field (or the higher the height above the ground), the smaller the drag force exerted by the center of the earth on the object;

(ii) the drag force exerted by the center of the earth is less for objects with lower mass and vice versa.

▲3. Regarding the concept of vacuum and vacuum degree: in terms of current scientific thinking, the relationship between atmospheric pressure and height is written as:

$$P = \rho gh = \rho(r - R)GM/r^2 \qquad (5\text{-}21)$$

where ρ denotes the density of atmospheric matter, which complies with the mass-velocity-energy relationship; $g = GM/r^2$ is the gravitational acceleration; $h = r - R$ is the height; and R is the radius of the earth. Referring to equations (5-17) and (5-18), $\Delta\rho \propto \Delta v$ and $\Delta\rho_0 \propto -\Delta v$. The degree of vacuum (γ) in science should be inversely proportional to the atmospheric pressure $(\propto 1/P)$:

$$\gamma \propto 1/P,\ (R + h)^2/h \qquad (5\text{-}22)$$

As a result, the degree of vacuum is greater at higher altitudes. Scientific experimentation has also confirmed this concept: as low-energy substances with coarse particles are separated $(\Delta\rho_0 \propto -\Delta v)$, what gradually appears in the vacuum hood is a finely-dispersed, high-energy substance $(\Delta\rho \propto \Delta v)$. This presents the difference in the distribution of substances and energy for different time and space fields between the macroscale and the microscale. The more microscopic a substance and the finer the particles, the greater the energy, velocity, density, and stability. Therefore, for any high-end pumping equipment, when the degree of vacuum reaches a certain limit, the vacuum hood will lose its shielding effect on the energy substances to a considerable degree. The vacuum substances both inside and outside will reach equilibrium. It may be said that the harm that high-vacuum and high-energy accelerators can cause to the human body is trivial and invisible. Empirical science is afraid to confront this reality.

▲4. The problem of objects falling in a gravitational field and meta-stable physics: the energy of objects in air becomes lower as they get heavier (because of factors such as corruption and aging), and they lose balance and

decrease in level as they fall. This dynamic relationship can be directly deduced from the equilibrium dynamic relationship given in equation (5-13):

$$f_{YN} = mv^2/r \leq f_{YN}^{'} = mg \qquad (5\text{-}23)$$

being the metastable dynamic relationship in the gravitational field. Why is it called a metastable state? In this equation, m, v, and r are all changeable physical quantities. In particular, mass and energy are independent variables and *r* is a dependent variable. The height from which the object drops to establish the new relationship of equilibrium depends on its state. It is possible to fall to the bottom (ground) or just float in the air. Different levels have different standards for the energy distribution of substances. An object will fall by reducing the standard if it does not reach the standard at that level. The next question is: if a light object and a heavy object fall at the same time from the same height, which one falls faster? Heavy objects fall faster than light objects. Why? This is one manifestation of the "microgravity effect" in low-level space: $f_{YN}^{'} = v\Delta m/\Delta t = GM/r^2 = mg$. At low speeds, we can use m_0 to replace m, and acceleration g is constant. Hence,

$$f_{YN}^{'} = v\Delta m/\Delta t = m_0 g, m_0 g \propto 1/\Delta t \qquad (5\text{-}24)$$

As such, a heavier object takes less time to fall to the ground in terms of the falling of misbalanced heavy objects. The problem of a falling body and the microgravity effect are two states unique to Earth's gravitational field. The current Newtonian theory of gravity only recognizes that apples (heavy objects) fall to the ground. However, it cannot explain why light objects always float in air instead of falling to ground.

▲5. *On the "twin paradox"*: in a thought experiment on Einstein's theory of relativity, one of a pair of twin brothers boards a spacecraft and undertakes long-distance space travel, while the other stays on the earth.

The result is that when the traveler returns to the earth, he finds that he is younger than the brother he left behind. This directly reveals a theory that humans who live in a high-energy environment are like vegetables, remaining fresh in refrigerators or a vacuum, becoming younger, and having longer lives. Of course, the requirements placed on humans are also high and they must assimilate into such a high-energy environment. Adverse environments affect us less if we can maintain a cheerful mood, regardless of the type of environment in which we reside. This result is not in agreement with Einstein's special relativity, which indicates some imperfections in the theory.

▲6. The problem of work: in the gravitational potential field, the radial magnetic force (i.e., "gravity") does work, W. According to equation (5-2),

$$W = \Delta V(r) = mg(-\Delta r) = mg(-\Delta h),\ W \propto (-\Delta h) \quad (5\text{-}25)$$

where $r = R + h$ and $\Delta r = r_2 - r_1 = \Delta h < 0$. The radial magnetic force ("gravity") points to the center of the earth and exerts positive work if the heavy object falls. Conversely, $\Delta r = r_2 - r_1 > 0$, i.e., the work is negative if the heavy object is lifted, with an energy cost.

▲7. *First cosmic velocity* ($v_{\text{I}} = 7.9Km/s$): the state equations of the gravitational field (5-12) reveal the condition for equilibrium between the kinetic energy and interactional potential energy of moving objects, $mv^2 = -GMm/r$, where $-1/r$ indicates that kinetic energy increases proportionally with r. If we use the radius of Earth R to replace r, we can derive the following: $v_1 = (GM/R)^{1/2}$. The first speed of the universe is called the surrounding speed, which is the minimum initial velocity required by an object launched from the earth to fly around it.

▲8. *Second cosmic velocity* ($v_{II} = 11.2Km/s$), which is also known as the escape velocity. According to the principle of energy conservation (the theorem of kinetic energy) in equation (5-4), $\Delta V(r) = \Delta E_k$, we can derive the following: $1/2\text{m}v^2 = GMm/R \rightarrow v_{II} = (2GM/R)^{1/2} = 2^{1/2}v_{I}$. This minimum speed to overcome the attractive force of the earth is the second cosmic velocity.

▲9. Nonlinear space-time curve of the gravitational field: the increase in the gravitational field's energy is consistent with the trend of a potential energy increase, as shown in equation (5-9), $\Delta(mv^2) = \Delta V(r)$, and the increase in velocity is also consistent with the increasing trend in potential energy in the potential field. Velocity is the ratio of the space/time field of particles. All particles are objects in motion and every individual is also an integral component of the whole space-time field. Therefore, the velocity of individual particles is also a function of time and space in the gravitational field; according to the metric time-space relationship in equation (5-3), $v = v(r,t)$, $v = \Delta r/\Delta t$.

According to the state equation of the gravitational field in equation (5-12), $\mathrm{m}v^2 = -GMm/r \rightarrow v^2 = -GM/r$, where "-" denotes the direction of the acting force. Here, we only consider the quantitative relationship and introduce it into the equation above ($\Delta r = v\Delta t$) to solve the differential equations of time and space in the gravitational field:

$$\Delta r = (GM/r)^{1/2}\Delta t \rightarrow r^{1/2}\Delta r = (GM)^{1/2}\Delta t \qquad (5\text{-}26)$$

As such, it is not difficult to solve the original function with the differential method. By integration, we obtain:

$$r^3 = (2/3)^2 GMt^2 \rightarrow r^3/t^2 = (4/9)GM \qquad (5\text{-}27)$$

Equation (5-27) reveals the space-time relationship of the gravitational field, where r denotes the radius of the potential field and t is the corresponding time. Furthermore, this equation is connected to Kepler's third law.

▲10. To crack the mystery of the human body on the earth's surface: humans live on the earth's surface, where the potential energy is low and the particles are large. The load placed on the human body is high and we can only move around in limited space. However, humans did not evolve from monkeys, as claimed by Darwin. Humans come from individual spaces in the universe. This is because a human can only drop out onto the earth when he does not meet the requirements of the universe at that level; conversely, if we can purify the substance that constitutes our body through

exercise and practice, we will just float up.

The universe's currently accelerated expansion challenges our current understanding of science with respect to time, space, and life. The misleading nature of evolutionism and the rumors and disinformation of atheism have caused the corruption of morals and led to there being no ethical standard and constraints on psychology and morality. Any bad thing could happen and the ethical standards of life in the universe ARE declining. The level and state of life in the universe are also declining and finally dropping down to an unwanted stage to eliminate bad people. Eventually, the negative things in the universe will accumulate, reaching a level that endangers the survival of the entire universe. The "Last Judgment", as mentioned in religion, holds that God will come at the last moment to escort good people up to heaven, while evil people will go to hell. However, *Liyi theory is not a religion, but it also believes that good and evil must be paid for accordingly*.

Since ancient times, people have explored the mysteries of life in the universe, the relationship between humans and nature, and our way of life. China's traditional culture advocates the theory that man is an integral part of nature; emphasizes favorable climatic, geographical, and human conditions; and pursues harmony between humans and nature. *Dafa* jurisprudence claims that "material and spirit are one and united" and *"Truth, compassion, and tolerance" are the nature of the universe and the law of nature.* They are the cornerstone of human morality and the basis of freedom and peace. They transcend time, space, culture, religion, and politics and are the eternal universal principle. From the perspective of content, *Liyi theory will be established based on the culture of life or culture of practice as the main body (or core), thereby forming the overall comprehensive cultural concept of space-time, life, the universe, the human body, and society to facilitate the improvement and nobleness of human life and our way of living*.

CHAPTER 6

WAVE-SPIN DYNAMICS IN THE ATOMIC POTENTIAL FIELD

Abstract: The atom may be considered to be like a miniature sun. Electrons, with negative charge, revolve around the nucleus. During this process, the attractive force (the Coulomb force) and the repulsive force (the centrifugal force) are in equilibrium. The central potential field of an atom (type I) exhibits a spherical layered-mass electromagnetic structure. The first and second characteristic structures of an atom reveal, respectively, the stability and spectral characteristics after the atom is excited/absorbed.

6.1 The dynamic basis for the atomic central potential field

We already know that there are different space-time scales at different levels inside an object. At the micro-scale, there is a powerful energy field, while the space-time scale shortens. At even lower scales, the energy field becomes stronger and the space-time scale decreases further.

By referring to the fundamental theory of dynamics in the central potential field of the earth (type II), we can derive the equation for the equilibrium force for the uniform circular motion of electrons around the nucleus and reveal the spherical layered-mass electromagnetic structure of the atom and its luminescence mechanism. The spin-dynamics basis for the

atomic central potential field originates from the following concepts.

6.1.1 The mass-energy-space-time four-image relationship for electrons

According to the four-image principle of Liyi theory, an electron is a typical relativistic particle; its variation with velocity in the mass-energy-time space is described in Table 6-1.

The speed required for an electron to revolve around the nucleus is notably lower than the speed of light. The resting mass of the electron (m_0) increases as the velocity decreases, and its dynamic mass increases with the velocity.

Table 6-1. Mass-energy-space-time four-image relationship for electrons.

1	Velocity and space-time	$V = D/T = \lambda v$	$D = \lambda$, $T = 1/v$
2	Energy, momentum, and space-time	$E = mv^2 = h'/T;$ $p = mv = h'/D = h'/\lambda$	$h' > h;\ 0 \leq v \leq c$
3	de Broglie matter wave (wave-particle-field tri-nature)	$\omega = 2\pi v = 2\pi E/h' = E/h';$ $k = \|k\| = 2\pi/\lambda = 2\pi p/h' = p/\hbar'$ $\rightarrow p = mv = h'/\lambda = (h' 2\pi)k = \hbar' k$ (k-space angular frequency, and ω-time angular frequency)	
4	Mass-velocity-energy relationship (non-linearity)	$m = m_0/\left[(1 - v^2/c^2)^{1/2}\right];$ m, $m_0 \neq 0;$ $\Delta m \propto \Delta v;\ \Delta m_0 \propto -\Delta v$	m-dynamic mass, m_0-rest mass.

6.1.2 The principle of field momentum conservation

As shown in Fig. 6-1, we can take a “binary system”, chosen according to Yin and Yang rules and the motion and rest of particles, as the object of study.

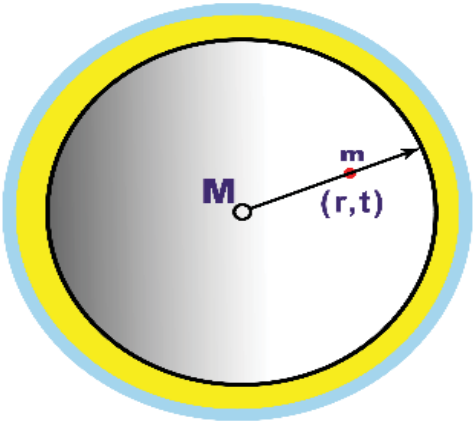


Fig. 6-1. Selection of a binary system and rules of Yin and Yang, motion and rest.

Here, the “binary” is made up of an atom (M) and an electron (m). The nucleus carries a positive charge, Yang, and the electron has a negative charge, Yin. In comparison to electrons, the mass of the nucleus is very large and can be considered motionless (at rest). In contrast, the electron (in motion) revolves uniformly around the nucleus at a specific velocity. According to the principle of field momentum conservation, this binary system is not subject to any external force and, therefore, the momentum remains conserved.

Table 6-2. Selection of binary system and rules of Yin and Yang, motion and rest

	Binary system: $\langle m\rangle \in \langle M\vert m\rangle$	Mass quality	Velocity	Momentum
1	Earth's gravitational potential field (Yin/rest)	M	v'	Mv'
2	Random particle in the potential field(Yang/motion)	$m\ (>0)$	$v\ (\geq 0)$	mv
3	$v' \approx 0,\ v \geq 0;\ m \ll M$			

The mathematical expression for the system is as follows:

(1) $F = (Mv' + mv)/\Delta t = 0$;

(2) set $\Delta(Mv')/\Delta t = 0$;

(3) $\Delta p/\Delta t = 0$.

Several points should be noted concerning the conservation of field momentum for the atomic binary system. Part (1) can be simplified as the conservation of field momentum of moving objects (3). In the following, we expand part (3). Therefore, we can solve the differential equation for the motion of the electron. Momentum is conserved for the selected binary system, which indicates that the momentum of the atomic central potential field does not change with time and the momentum of simplified moving objects (electrons or electron-like particles) does not change with time. This concept further evolves into the conservation of field momentum. In the following, we will discuss the deduction of the law of equilibrium force from the conservation of field momentum, which is also called the law of uniform circular motion of electrons.

6.2 Derivation of the equation for uniform circular motion

6.2.1. The equilibrium force from the conservation of field momentum

Momentum is the product of mass and velocity. If *v* and *m* are not equal to zero, we can calculate the partial derivative with respect to time and further derive the equation of equilibrium relationship:

$$\Delta p/\Delta t = \Delta(mv)/\Delta t = m\Delta v\Delta t + v\Delta m\Delta t = f + f' = 0 \quad (6\text{-}1)$$

This is the relationship of equilibrium force. In this equation, $f = m\Delta v\Delta t$, and $f' = v\Delta m\Delta t$. If $\Delta v/\Delta t \neq 0$ and $\Delta m/\Delta t \neq 0$, by referring to Newton's second law of motion, the acceleration of moving objects is $a = \Delta v/\Delta t$, and the equation mentioned above (6-1) becomes the following relationship of motion:

$$m\Delta v\Delta t = -v\Delta m\Delta t \ (\Delta m \leq 0) \quad (6\text{-}2)$$

where the acceleration is a = Δv/Δt. By eliminating the common time factor, $1/\Delta t\ (\neq 0)$, in equation (6-2), we derive a two-variable partial differential equation:

$$m\Delta v = -v\Delta m \ (\Delta m \leq 0) \quad (6\text{-}3)$$

then, we divide both sides by $v/2$ and change the equation into another form (on the left side, m remains unchanged and v changes, while on the right side, v remains unchanged and m changes, with $\Delta m \leq 0$):

Divide the left side by $v/2 \rightarrow v/2m\Delta v = \Delta(mv^2)$;

Divide the right side by

$$v/2 \rightarrow v/2(-v\Delta m) = \Delta(1/2mv^2) = \Delta E_k \quad (6\text{-}3')$$

Here, $E_k = 1/2mv^2$ denotes the kinetic energy of moving objects. It should be emphasized that, only when $\Delta m \leq 0$, we ensure that the left and right sides of this equation are always positive and that the following derivation can proceed. This is constrained by the correct law of "no loss, no gain" in the universe. These mathematical expressions always appear in

pairs as "$\Delta m \leq 0$ and $\Delta E_k \geq 0$". The left and right sides are, respectively, introduced into equation (6-2) to constitute a perfect differential equation:

$$\Delta(mv^2) = \Delta E_k \tag{6-4}$$

According to the law of energy conservation, $\Delta V(r) = \Delta E_k$, we can transform the partial temporal differentiation on the right side of equation (6-4) into a partial spatial differentiation. Therefore, we can derive the state equation for the atomic central potential field in the form of perfect differentiation:

$$\Delta(mv^2) = \Delta V(r) \tag{6-5}$$

In terms of mathematics, if the derivatives of two physical variables are equal, then these two variables differ at most by a constant, for example, c_1:

$$mv^2 = V(r) + c_1 \tag{6-5′}$$

Equation (6-5′) must hold for any velocity. According to the boundary condition of an atomic potential field, $\mathrm{r} \to \infty$, $mv^2 \to 0$, and the potential energy of moving objects (electrons) $V(r_{\infty}) \to 0$. This leads to the constant $c_1 = 0$, which is introduced to the state equation to obtain the following integral form:

$$mv^2 = V(r) + 0 \tag{6-6}$$

Additionally, according to the law of interactive potential/force for Li Yin and Yang, the interactive potential of the electron and nucleus is:

$$V(r) = kZe(-e)/r \tag{6-6′}$$

introduced into the above equation to obtain:

$$mv^2 = kZe(-e)/r = -kZe^2/r \tag{6-7}$$

where equation (6-7) is the state equation of the (atom's) central potential field in differential form. This relationship is critical and many disciplines, including dynamics, electromagnetism, and wave dynamics, are all based on this relationship.

6.2.2 The YN equation of uniform circular motion

We multiply both sides of the equation (6-7) by $1/r$, then we can derive the equation for the circular motion of electrons around the nucleus:

$$mv^2/r = -kZe^2/r^2 \ (i.e. f = -f') \qquad (6\text{-}8)$$

where $f_{YN} = \mathrm{m}v^2/r = ma$, the acceleration is $a = v^2/r$, and $f_{YN}' = kZe^2/r^2$. Equation (6-8) is the equation for uniform circular motion of electrons around the nucleus. We also have the following relationship for the equilibrium force:

$$mv^2/r + kZe^2/r^2 = 0; \ f_{YN} + f_{YN}' = 0 \qquad (6\text{-}9)$$

6.2.3 Solving for space-time factors

In the process of solving differential equations, we have separated out the time factor $1/\Delta t \neq 0$. Now we solve for the value range of Δt. As for the atomic system, the field momentum of electrons is conserved. $\Delta p/\Delta t = 0$ (but the momentum is not equal to zero), where $1/\Delta t \neq 0$. Δt is also a microphysical quantity with a certain range of values, and time and space are stratified so that we can write:

$$\Delta t = \alpha T \qquad (6\text{-}10)$$

Here, T is the temporal period variable of moving particles, and α is a parameter. According to equation (6-10), the temporal interval and temporal level are related. The two variables of time and space are independent and related. As for the solution for the space factor, when $r \to 0$ and $1/r_{\infty} \to 0$, the distribution of atomic energy, mass, and charge confines the atomic high and low-energy field boundaries. The atom exhibits a type-I central potential field: the energy is high at the center, and low at the outskirts, i.e., the atom has two boundaries with high and low energy fields. In the following, we will further consider this problem.

6.3 Four laws of conservation for the electron layers

Two electrons with opposite spin directions constitute a Yin and Yang electron pair, wrapping the nucleus in the middle and forming a stable tridimensional spherical Yin and Yang Tai Chi unit. This can be described as “against Yin and around Yang” and indicates stability.

6.3.1 Structural model of Tai Chi Yin and Yang electron pairs

According to Noether’s Law, Ls is invariant with respect to time and space. It is derived as follows:

(i) L_s is invariant with respect to time: $\Delta L_s/\Delta t = 0;\ \rightarrow \Delta L_s = 0,\ \Delta t \neq 0$; let $\Delta L_s = xL_s = 0$, $L_s \neq 0$; $\rightarrow x = 1 + (-1) = 0$; $\therefore$ spin quantum number $m_s = \pm 1$. Additionally, the spin angular momentum is quantized, $L_s = (L_s)_n,\ n = 1,\ 2,\ 3,\ \ldots$

(ii) Ls is invariant with respect to space: $\Delta L_s/\Delta r = 0/0;\ \Delta L_s = 0,\ \Delta r = 0;\ \rightarrow$ one pair of conserved quantities: radius of spherical layer and spin angular momentum of an electron: $r = r_n,\ L_s = (L_s)_n$;

(iii) Q.E.D., spin angular momentum is conserved.

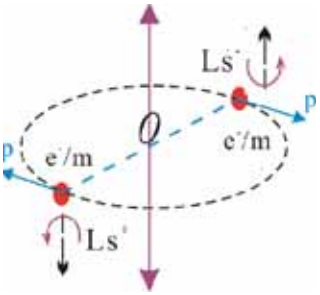


Fig. 6-2. The spin direction of Yin and Yang electron pairs is oppositional

For one pair of Yin and Yang electrons, the two spin angular momenta (L_s), equal in magnitude and opposite in direction, act on the central axis. In this manner, we can reveal that the atomic particle exhibits of spherical structural states.

6.3.2 The YN law of equilibrium force-uniform circular motion

As the earth revolves around the sun, the energy level (namely, the equipotential surface) inside the atom is discrete and discontinuous, i.e., the electrons on the different energy levels are distributed on different equipotential surfaces, $n = 1，2，3，$. Let the radius of the nth equipotential surface be r_n. According to equation (6-8), we can derive the following law of electrons moving on discrete equipotential surfaces (or orbits):

$$m_n v_n^2/r_n = -k_n(Ze)e_n/r_n^2 \qquad (6\text{-}8')$$

Table 6-3. Atomic (I) spherical layered-mass electromagnetic structure.

	Discrete energy levels of atom，n ($n = 1，2，$ ...)	$v_n = D_n/T_n$
1	The equation for the electron to revolve around the nucleus	$m_n v_n^2/r_n = -k_n Ze^2/r_n^2$
2	Potential energy for the interaction between electron and nucleus	$\mathrm{V}(r_n) = -k_n Ze(e)/r_n$
3	Square of electron velocity	$v_n^2 = k_n Ze(e/m)r_n$
4	Kinetic energy of electron (positive)	$E_k = 1/2m_n v_n^2 = 1/2k_n Ze^2/r_n$
5	Energy on the nth energy level (negative)	$E_n = E_k + V(r_n) = -1/2k_n Ze^2/r_n$

This is the law of equilibrium force deduced from the law of conservation of field momentum; it is also called the YN (micro-particles) law of uniform circular motion (Y means "Yi" pronounced 'yi' and N indicates "Newton"). In other words, for electrons that move uniformly on different equipotential surfaces, their four-image mass, energy, time, and space and their charges are different. The atom exhibits a spherical layered-mass electromagnetic structure, but the space between T layers is not hollow. Instead, it is filled with electromagnetic energy on different levels. According to the four-image principle, the mass, charge, and rotational velocity of electrons on different equipotential surfaces are different, as shown in Table 6-3.

6.3.3 Proof of conservation of atomic momentum

The atom exhibits a spherical layered-mass electromagnetic structure. Let us only consider that the electron (m, v) and nucleus (M, v') constitute a binary system and are not subject to an external force in the radial direction. According to the principle of momentum conservation, (1) $F = (Mv' + mv)/\Delta t = 0$; (2) set $\Delta(Mv')/\Delta t = 0$; (3) $\Delta p/\Delta t = 0$; if $\Delta t \neq 0$, there is $\Delta p = 0$;

$$p = const \tag{6-11}$$

This is the law of momentum conservation. This law indicates that the momentum of an electron in an in-layer is $p_n = m_n v_n$ and $(\Delta t)_n$ has a specific, definite value.

6.3.4 Conservation of angular momentum in an atomic orbit

Because atomic orbits are quantized (conservation of spin angular momentum), we can assume that the energy level of a certain shell, n, is $r = r_n$. This equation can be combined with the equation for conservation of momentum to derive the quantization of angular momentum:

$$L_n = r_n p_n = n\hbar,\ \ L_n = r_n p_n \qquad (6\text{-}12)$$

6.4 Solution for the boundary conditions of an atom

According to the state equation (6-7), $mv^2 = kZe(-e)/r = -kZe^2/r$. First, at the boundary of a high-energy field, when $r \to 0$, $mv^2 = V(r) \to$ an extremely large value. As a result, the potential energy at the atomic center (nucleus) is extremely high and, therefore, the atom exhibits a type-I central potential field. Second, at the boundary of a low-energy field, where $r \to \infty$, $mv^2 \to 0(\neq 0)$、$V(r_\infty) \to 0(\neq 0)$. Consequently, the boundary of the atom's low-energy field is close to the matter-space on the surface molecular layer, which means it is connected to the potential energy on the earth's surface. In other words, $r \to \infty$ for the mass of moving objects (not necessarily electrons) $(\neq 0)$, charge, and velocity. This concept represents confinement on the low-energy field boundary of the atom's potential field (type I).

Table 6-4. Electrons (or electron-like particles) are on different energy levels (orbits).

	Electrons (or electron-like particles) are on different energy levels (orbits), $n = 1,\ 2,\ \ldots$	
1	The velocity decreases as n increases: $v_1 > v_2 > v_3 > \cdots \to$	$\Delta v = v_n^{'} - v_n < 0;$ $n^{'} = n+1,\ n+2$
2	Charge amount also decreases: $\lvert q_1\rvert > \lvert q_2\rvert > \lvert q_3\rvert > \cdots \to 0$	$\Delta\lvert q\rvert = \left\lvert q_n^{'}\right\rvert - \lvert q_n\rvert < 0$
3	Mass and its change: $m_1 > m_2 > m_3 > \cdots \to 0$	$\Delta \mathrm{m} = m_n^{'} - m_n < 0$

Outside the nucleus: the relationship of the nucleus to the boundary of the low-energy field when $r_n \to \infty$, is, $V\left(r_\infty\right) = -kZe^2/r_\infty \to 0$, $mv^2 \to 0$.

Inside the nucleus: high-energy end, $r \to 0$, mv^2、$V(r) \to$ r $\to$ extremely large.

For moving particles outside the nucleus (not all of them are electrons) at different energy levels and electron-like particles (with negative charges less than 1), physical quantities, such as mass, energy, charge, and velocity, decrease as the radius of potential field (r_n) increases until they approach zero, as shown in Table 6-4. This behavior reveals that the mass-energy-space-time, velocity, and charge of electrons (or electron-like particles) regularly change as the radius increases.

According to Table 6-4, for the negatively charged layer outside the nucleus, the mass, energy, and velocity are different for electrons (or electron-like particles) at different energy levels, further leading to different atomic structures and physical and chemical properties. As the energy level changes, the regularity is as follows:

(i) On energy levels that are closer to the nucleus, the potential energy becomes more negative (i.e., it has a larger negative value) and the kinetic energy of the electrons is greater. If the kinetic energy of the electrons is greater, it is more stable, and vice versa. The energy of an energy level (which is equal to the sum of the kinetic energy and potential energy of an electron) is negative.

(ii) On energy levels that are closer to the nucleus, the negative value of the electron charge is greater and the negative value of the electron charge gets smaller as it comes closer to the boundary of the low-energy field, finally approaching zero.

(iii) The spin dynamics have two important rules: first, v, $V(r) \propto 1/r$. Second, we have the rule of velocity-interaction potential energy relationship, $\Delta v \propto \Delta V(r)$.

(iv) According to the mass-velocity-energy relationship, m, the dynamic mass and energy of moving particles (electrons) become larger as velocity (or speed) increases; in contrast, the resting mass (m_0) increases as the velocity (or speed) decreases.

Therefore, in the periodic table of elements, we now have 118 chemical elements that correspond to different structures. As a result, they make up everything in the world. A molecule consists of atoms. An atom has a stable, convergent, and open structure (and shows emission and absorption on excitation). The atom exhibits a spherical layered-mass electromagnetic structure and has a type-I central potential field. The atom has two boundaries with high and low-energy fields. The energy in the outer layer of an atom is low. Thus, chemical changes can easily occur, forming molecules and all types of compounds, namely, anything in the macroscale superficial world of matter. This process has been understood by modern science in its consideration of the environment of the low-energy field.

6.5 Conservation principle and conserved quantities

Table 6-5. Equipotential surface outside the nucleus (with primary quantum number n) and solution for the fine structural parameters.

1	Law of uniform circular motion	$\mathrm{m}v_n^2/r_n = -kZe^2/r_n^2$;	$v_n p_n = kZe^2/r_n$; $k = 1/4\pi\pi^*$
2	The rotation speed of the electron	$v_n = kZe^2/r_n/(mv_n)$; $p_n = mv_n$;	$p = mv = h'/\lambda = (h'/2\pi)k = \hbar' k$; $k = 2\pi/\lambda = 2\pi p/h' =$

3	Wave-particle duality	$p = mv = h'/\lambda = (h'/2\pi)k = \hbar' k$	$p/\hbar' k$ spatial angular frequency
4	Conservation and quantization of angular momentum	$L_n = rmv = rp = rk\hbar'$	$L_n = r_n p_n = n\hbar$; according to the above equation, $n\hbar = rk\hbar' \rightarrow n = rk(\hbar'/\hbar) = r(k/2\pi) = r/\lambda$
5	Primary quantum number	$n = r_n\lambda_n = r_n/D_n$, λ_n	spatial scale of the n[th] electron layer
6	The radius of the electron shell	$r_n = n\lambda_n$; $n = 1, 2, 3 \ldots$	
7	Fine parameters (quantity) α	$v_n = (Ze^2/4\pi\varepsilon)/r_n/mv_n = Z(e^2/4\pi\varepsilon)(c/n) = Z\alpha c/n$, $\therefore \alpha \equiv e^2/(4\pi\varepsilon\hbar c) = e^2/(2\varepsilon hc)$	$E_n = mv_n^2 = m(Z\alpha c/n)$ The maximum rotation velocity of electron $(n = 1)$: $v_1 = Ze^2/(2\varepsilon hc) = \alpha(Zc)$.
8	The rotational speed of electrons of the hydrogen atom around the nucleus is $v_1 = \alpha c$ $(Z = 1, n = 1)$. *1/ε-electric conductivity of magnetoelectric medium (discussed later)		

The YN (micro-particles) law of uniform circular motion and three conservation laws for micro-particles (conservation of momentum, conservation of angular momentum, and conservation of spin angular momentum for Yin and Yang electron pairs) are independent, but correlated. We can combine them to determine some important parameters of the atomic structure and several important parameters often considered in quantum mechanics are listed below:

(1) Electron orbits are discrete and quantized and the angular moment of electrons on the n[th] orbit is $L, n = 1，2，3，...$;

(2) Primary quantum number: $n = r$;

(3) The radius of the shell layer for the electrons: $r_n = n\lambda_n$;

(4) Fine structural parameters: $\alpha \equiv e2/(2\varepsilon hc)$, $\hbar = h/2\pi$. See Table 6-5 for details.

6.6 Spherical layered-mass electromagnetic structure

6.6.1 Kinetic energy of the electron

As mentioned above, an equilibrium force means that when an electron (moving object) is subject simultaneously to the action of two forces with equal magnitudes and opposite directions (and along the same straight line), the electron remains in a state of uniform circular motion. This state is determined by the mechanism of the central potential field. The direction of movement of the electron is along the tangential direction of the circle, namely, vertical to the longitudinal line (radius r_n) of the potential field; the moving velocity is,

$$v_n^2 = kZe^2/(mr_n);\ v_n = (kZe^2/mr_n)^{1/2} \qquad (6\text{-}13)$$

We can see from this equation that the velocity of the electron is proportional to Ze, e/m, and $1/r_n$. As such, the velocity of electrons with uniform circular motion increases as the radius of the potential field decreases, which thus implies that the kinetic energy of the electron's motion also decreases as the radius of the potential field decreases:

$$E_k = 1/2mv_n^2 = 1/2kZe^2/r_n \qquad (6\text{-}14)$$

Equation (6-14) indicates that the kinetic energy of the electron is positive and inversely proportional to the radius of the potential field, r_n, thereby indicating that the kinetic energies of electrons on energy levels closer to the nucleus are larger. The larger the kinetic energy, the more stable the electron (i.e., the energy required to excite the electron is larger) and vice versa.

6.6.2 Energy distribution on the discrete energy levels of an atom

The energy of an electron in the n^{th} shell is $E_n =$ kinetic energy + potential energy:

$$E_n = E_k + V(r) = 1/2kZe^2/r_n + (-kZe^2/r_n) = -1/2kZe^2/r_n(\text{negative}) \quad (6\text{-}15)$$

where $n = 1$, 2, 3, and r_n represent the radius of the n^{th} orbit. As the sequence number of the energy level (n) decreases, the magnitude of the energy is larger $(\propto -1/r_n)$ and the electron becomes more stable. This trend occurs because the negative property is stronger for energy levels closer to the nucleus (i.e., the shielding capability is larger) and the interaction force with the nucleus is stronger.

6.6.3 The second characteristic structure of the atom

The atomic spherical structure model is a stable, non-closed, convergent, and open system; it has certain patterns by which it absorbs and emits energy. There is a gap and energy difference in atomic energy levels and the nucleus, which can be viewed as the atom's second characteristic structure (also called a string circle). The first characteristic structure (closed circle) ensures that the atomic structure is stable and convergent; the second characteristic structure reveals the opening characteristics of atoms, i.e., the mechanism of excited radiation/absorption, which does not affect atomic stability. Every atom has its characteristic spectral line. There is only one electron outside the hydrogen nucleus, but there are more than ten or even tens of energy levels. The common emission spectrum of the hydrogen atom is composed of one ultra-violet series (Lyman series), one visible light series (Balmer series), and an infrared series. The law of light radiation is expressed as follows:

$$h\nu = (E_n^{'} - E_n),\ |E_n| > \left|E_n^{'}\right|,\ n^{'} > n \qquad (6\text{-}16)$$

On this basis, the law of radiation complies with the Bohr frequency condition. Introducing $c = \lambda\nu$, namely $\nu = c/\lambda$, into the relationship for the law of light radiation, as shown in equation (6-14), we can derive the Bohr frequency condition:

$$1/\lambda = \Delta E/ch = (1/ch)(E_n^{'} - E_n),\ |E_n| > \left|E_n^{'}\right|,\ n^{'} > n \qquad (6\text{-}16')$$

Therefore, the atom is an ordered, harmonious, convergent, open, stable, and self-consistent system.

The correctness of this emission mechanism in shown in three aspects: first, it complies with the early 20th century Rutherford model, which presented a correct atomic model. This model assumes that a negatively charged electron revolves around a positively charged nucleus, like a planet moving around the sun. Second, in this process, the Coulomb force and centrifugal force remain balanced. Third, the second characteristic structure reveals that an atom's spontaneous or excited radiation does not change its stability. Additionally, the radiation spectrum of atoms, as shown in Fig. 6-3c, comprises a series of discrete emission lines. This fact does not conflict because the molecular emission spectra of sunlight and electric incandescent lamps are "continuous" and the radiation spectrum of atoms is the integral of numerous different molecular and atomic emission lines. The molecule is composed of atoms, and each atom is composed of more micro-particles.

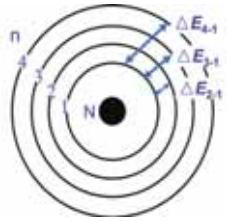


Fig. 6-3(a)

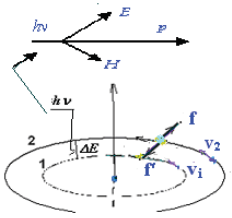


Fig. 6-3 (b)

Fig. 6-3 a, b. Mechanism for the emission of atomic second characteristic structure:

$$\Delta E_{n'-n}^{'} - n = h\nu$$

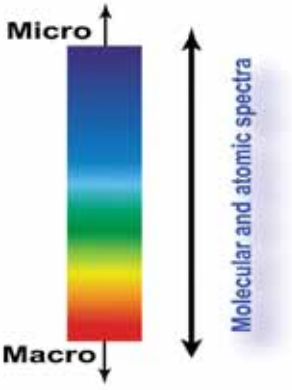


Fig. 6-3(c)

Fig. 6-3(c). Nine-color spectrum of molecular and atomic radiation

As shown in Fig. 6-3a, b, when an electron is close to the inner layer, the difference in atomic energy levels is larger, the frequency of radiated light is higher, and the overall energy is higher. The emission mechanism of atoms is determined by the essence of the atomic spherical layered-mass electromagnetic structure. This emission mechanism fundamentally denies the existing theory of electronic transition luminescence. Finally, in the universe, the sphere is the most beautiful structural shape.

6.6.4 Existing theory of electronic transition luminescence

Bohr believed that the atom has a stable structure and established the model of atomic energy levels. Moreover, he applied the Bohr frequency condition to justify himself and interpret the phenomenon of atomic emission. However, we cannot agree with Bohr's beliefs if we apply the theory of electronic transitions to explain the mechanism of atomic emission. The idea of electronic transition presumes that the atomic structure has low energy in the inner layer and high energy in the outer layer. When the atom is excited, an electron in a certain inner layer of the atom is ionized, forming a vacant position. When electrons in other outer layers transit to this vacant position, they release excess energy in the form of electromagnetic radiation. This electromagnetic radiation is the characteristic form of X-ray emission of atoms, as shown in Fig. 6-3b. Thus, electrons with relatively high energy move along orbits relatively far from the nucleus. They release energy when they transition from high energy levels (outside) to low energy levels (inside). The idea of electronic transition has three apparent contradictions: (1) this electronic transit inevitably changes the stable structure of the atom, which conflicts with the idea that the atom is a stable electromagnetic structural body; (2) this idea violates the law of conservation of energy. The electron does not have the energy necessary to transit from the outer low-energy level to the inner orbit. There is no excess energy to be radiated in the form of light; (3) the idea does not comply with experimental results. We all know that it requires thousands of volts to excite an atom's inner radiation (such as X-rays), while only household electricity is necessary to excite the outer spectra of atoms and molecules. Therefore, the assumption that "electrons in the outer layer have high energy and those in the inner layer have low energy" in electron transit is wrong.

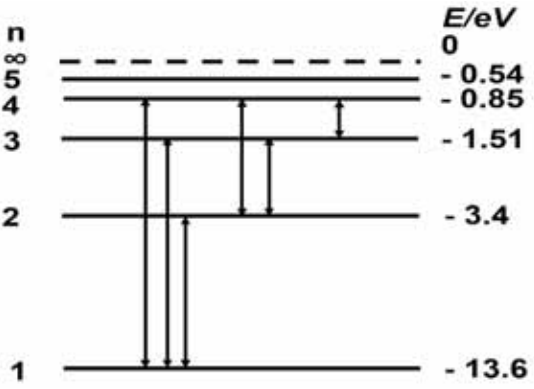


Fig. 6-4. Error correction (correct the one-way arrows as two-sided arrows)

6.7 Deduction of atomic structure

"Everything has Yin and Yang": "one Yin and one Yang is called the rule" and Yin and Yang are independent and correlated; the three principles of Yi theory are fully manifested in the atomic structure. An atom is composed of a nucleus and electrons. Just like the planets that revolve around the sun, electrons with negative charges move around the nucleus, which has a positive charge. In this process, the attractive force (the Coulomb force) and repulsive force (the centrifugal force) exerted on the nucleus's electrons remain balanced. The atom has two boundaries of high and low-energy fields. Yin and Yang represent two opposed aspects of things; they are dependent on each other and neither part cannot exist if separated from the other. Each part exists on the condition of the existence of the other part.

6.7.1 Atomic closed circle and characteristic structure of closed string

In the central potential field of an atom (type I), the energy is distributed in layers: the first characteristic structure (closed circle) of the atom reveals that the atom is centered on the nucleus (Yang) and the electrons (electron-like particles) exhibit a discrete and ordered shell distribution. As for the second characteristic structure (closed string) of atoms, the gap between energy levels is called the potential difference or energy difference. It has independent structural characteristics allowing the absorption or radiation of energy to adjust and maintain the equilibrium and stability of the energy system. This is also the essence of atomic emission and radiation.

6.7.2 Atom L-Tai Chi diagram (Yin around Yang)

The atom exhibits a spherical layered-mass electromagnetic structure and has a type-I central potential field. The atom has two boundaries of high and low-energy fields, which correspond to two different types of Tai Chi diagram.

6.7.3 Atom H-Tai Chi diagram (Yang around Yin)

The atomic (type-I) central potential field has two boundaries of high and low-energy fields, which correspond to two different types of Tai Chi diagram. In addition to the aforementioned atom L-Tai Chi diagram (Yin around Yang), there is also the H-Tai Chi diagram (Yang around Yin). The H-Tai Chi feature has the high-energy field boundary on the outside and the low-energy field boundary on the inside, presenting the structural image of Yang around Yin.

Let us say that the atom L-Tai Chi diagram complies with science and the physical concept of humans in the world. The H-Tai Chi structural

diagram (Yang around Yin) emphasizes the spiritual level, with a higher state of consciousness. The Tai Chi diagram for the atom's (type I) and the earth's (type II) central potential fields describes a scientific principle revealing that the micro energy is higher than the macro energy and that this principle permeates everything. The sky is Yang, while the ground is Yin, and China's traditional culture connects this through everything, including heaven, the ground, and humans. Some say that atoms, molecules, the human brain, the earth, the solar system, and the galaxy are all incarnations of the Tai Chi diagram. The Tai Chi diagram is the standard model for the Yin and Yang structural model of all particle matter. This claim may be true.

6.7.4 Atom-pyramid configuration

We are all familiar with pyramids. In the pyramid configuration of an atom, the pyramid's tip extends from the nucleus to the smaller end and it is too high to see the top. The pyramid body extends downwards from the nucleus to the bottom of the pyramid, located on the earth's surface in the gravitational potential field. It can further develop towards the larger end (e.g., other planets). As we all know, the pyramid configuration involves virtue and virtue is energy. The pyramid configuration of the atom is the storage and evolution of energy, manifested in many aspects: 1) the energy is distributed from the macro to the micro and from low to high; 2) the potential is distributed from low to high; and 3) the dynamical mass increases as the velocity (high) increases. The opposite is true for the resting mass, which increases as the velocity (height) decreases. The gravitational potential of the earth is derived from a unique structural body on the molecular level.

6.7.5 The harmonious principle of Liyi theory

The "harmonious principle of Liyi theory" is deduced from the intrinsic meaning of the atom's pyramid configuration and the Yin and

Yang configuration of Tai Chi. It is called “He”, “Zhong”, “Shu”, and “Zhi”, in the perspective of this harmonious principle. “He” means harmonious, consistent, and compliant. “Zhong” means center, symmetric, neutralization, and moderation. “Zhi” means mass and the essence of electricity and magnetism, which are on different levels and of different categories. “Shu” means number, mathematics, and rules.

As for “number”, because the motion of everything in the universe is regular and pre-determined, we can use “number” to describe everything. These rules can be expressed with simple symbols or numbers. The Book of Changes (I Ching) says that “One Yin and One Yang is called the rule”, therefore, in the guiding ideology of Yi theory, change in Yin and Yang is at the core of Yi theory. The Yi theory-physical-mathematical model substantially exceeds the range of the model of the universe as understood by human eyes. In contrast, it is still far from the final truth of the universe and, under specific or fixed conditions, these mathematical models, to some extent, play a role in revealing the universe to humankind. Liyi theory studies everything from phenomenon to essence and it is simple and concise. Its basic principle is also plain and universal. As a scientific and cultural phenomenon, it is manifested in more than just these aspects. The rise of a scientific culture has to comply with our intrinsic thoughts about the universe, humankind, or societal rules. Humankind and nature should be in harmony, humanity should be in harmony, and everyone’s body and will should also be in harmony. Only in this manner will the culture comply with the correct rule of law in the universe.

Our new century is a significant epoch and should be the century in which we integrate Eastern and Western cultures. It is time to integrate the advantages of Eastern and Western scientific cultures, which intersect and complement each other. It is time for “integration”, “moderation”, and the “pyramid”. Yi theory expresses morality and morality is energy. Of course, one excellent culture will inevitably play a role in promoting and leading humankind. The understanding of human beings in one culture is based on

their natural intrinsic values. We will see the true logic only if we overcome the limitations of current empirical science and stand on the highest level.

6.8 Connection between the macro and the micro

The movement of the universe follows a set of rules. The same rule has different variations and forms at different levels. All the beginnings that humankind is aware of are circular and they almost all have perfectly round shapes. The orbits of stars are round or nearly round and the shape of the galaxy, which is composed of numerous stars, is also round. Here, "round" means full, consistent, in equilibrium, and in harmony. It is the optimal state for the existence of the universe.

An object has its own particular phenomena and nature. In Table 6-6, we compare the correlation between the spin dynamics for the (I) central potential field of an atom and the (II) central potential field of the earth. Except for the micro-discrete orbits of an atom, other rules of motion are nearly consistent in their forms of expression. The difference in the boundary conditions indicates that the type-I (atomic) potential field and type-II (molecular) potential field are connected, reflecting the connection, harmony, and order of the macro and microscales. The dynamic theory for the type-II (Earth) central potential field is the law of uniform circular motion in a gravitational field.

Uniform circular motion means that the direction of motion of moving objects is perpendicular to two equilibrium forces. When these two forces, which act on the same straight line with different properties, are equal in magnitude and opposite in direction and act on the same object, the object will move uniformly in a circle around the center (such as the axis of the earth or the nucleus of an atom). This type of motion has spin.

Gravity is an electromagnetic force on the molecular level. In particular, the electric force (repulsive force) and magnetic force (attractive force) are equal in magnitude and opposite in direction (along the same

straight line) and act on the same moving object.

Table 6-6. Comparison of spin-dynamic relationships in a central potential field.

No.	Category		Atomic (I) central potential field	Earth (II) central potential field
1	Deduction of conservation of field momentum Equilibrium force		$\Delta p/\Delta t = \Delta(mv)/\Delta t$ $= m\Delta v/\Delta t + v\Delta m/\Delta t$ $= f + f' = 0$	
2	Law of uniform circular motion-equilibrium force and equation of motion		$\mathrm{m}v_n^2/r_n = -kZe^2/r_n^2$ $f_{YN} = m\Delta v/\Delta t = mv_n^2/r_n$	$\mathrm{m}v^2/r = -GMm/r^2$; $(f_{YN} = -f_{YN}')$ $f_{YN} = m\Delta v/\Delta t = mv^2/r$
			$f_{YN} = m\Delta v/\Delta t = ma;\ a = \Delta v/\Delta t = v^2/r$	
3	State Equation of potential field	Integral form	$\mathrm{m}v_n^2 = -kZe^2/r_n$	$mv^2 = -GMm/r$;
		Differential form	$\Delta(mv^2) = \Delta V(r)$	$\Delta(mv^2) = \Delta V(r)$
4	Atomic spectrum		$1/\lambda_{n'-n} = \Delta E/ch = (1/ch)(E_{n'} - E_n)$; $(n < n')$	

5	Universal mass-velocity-energy relationship	$\mathrm{m} = m_0/(1 - v^2/c^2)^{1/2};\ (0 \le v \le c);\ \Delta\mathrm{m} \propto \Delta\mathrm{v};\ \Delta m_0 \propto -\Delta v$	
6	Law of equilibrium interactive potential/force	$\Delta V(r)/\Delta r = kx_1x_2/r^2 = -kZe^2\ /\ r_n^2$	$\Delta V(r)/\Delta r = -kx_1x_2/r^2 = GMm/r^2;$
	Earth (surface) boundary condition	$mv^2 \to 0,\ v^2 \to 0,\ V(R) = GMm/R;\ r = R$, radius of Earth's surface	
7	The boundary of the atomic low-energy field	$mv^2 \to 0,\ v^2 \to 0,\ V(r_\infty) \to 0,\ r = r_\infty$, maximum radius of the atomic potential field	
8	Premise or test	$\Delta p = 0,\ \Delta\left(Mv'\right) = 0; \Delta t \neq 0$	
9	Binary system (field-model)	$\langle m\rangle \in \langle M|m\rangle,\ m \ll M.$	

The velocity of this moving particle remains unchanged, but the direction of movement always changes. Everything in the range of the earth's potential field (including the human body) follows this rule of motion. This logic can be understood when we move out of this system. The electron moves uniformly around the nucleus on the micro-scale, similar to an atom's central potential field. The direction of movement of moving objects is perpendicular to the two balanced forces. These two forces have different properties, are equal in magnitude, and opposite in direction; they act on the same moving particle (electron) along the same straight line. As such, this object moves uniformly in a circle around the nucleus. The moving orbits of electrons (or electron-like particles) are discrete and ordered, which is the most significant difference between micro-particles

and the macro gravity field.

Any object that moves at high speeds around an axis will generate two types of force: one is centrifugal force and the other is centripetal force. Both of these forces are forces in horizontal and lateral directions. The longitudinal force is caused by an ordered, but non-uniform distribution of energy in the entire potential/force field. Moreover, regarding the existence of constants in physics, physicists believe that the physical laws found on Earth can be applied to any corner of the universe; this is not the case. According to the YN law of uniform circular motion, based on the results of comparison between the relationship of the equilibrium of forces and the equation of motion, let us now give the mathematical expression for force coefficients (G and k) in the form of a table (Table 6-7). According to the comparison of two equilibrium forces with different properties in the equation of circular motion in a gravitational field, the corresponding acceleration is equal in amplitude and opposite in direction; the ratio is $a/g = -1,\ g = -GM/r^2$. As for the central potential field of an atom, the ratio is $a_n/g_n = -(e/m)_n,\ g_n = kZe/r_n^2$.

The atom is like a miniature sun. An electron revolves around the nucleus, just like the earth moves around the sun. The energy is discrete and ordered. An atom's discrete energy levels can be derived from the equation for the circular motion of electrons around the nucleus. This model also proves that the dynamic coefficients (G and k_n) are not constant. Under specific conditions, the measured values of modern empirical science have certain reference values, but these are not general values.

Table 6-7. Comparison of the dynamic coefficients of gravitational (II) and atomic (I) central potential fields.

1	$mv^2/r = -GMm/r^2;$	$f_{YN} = -f_{YN}^{'}$	
2	$f_{YN} = m\Delta v/\Delta t = ma,$ $a = \Delta v/\Delta t,$	$a = -g,\ g = -\Delta v/\Delta t$	$g = GM/r^2$ g, G dynamic parameters (macro/changeable)
3	$f_{YN}^{'} = GMm/r^2 = mg, g = GM/r^2;$	$a/g = -1$	
4	Space-time relationship curve for gravity field (II)	$r^3/t^2 = (4/9)GM;\ 1/G = (9/4)(t^2/t^3)M$	
	Atomic (I) central potential field		
1	$\mathrm{m}v_n^2/r_n = -kZe^2/r_n^2$		
2	$f_{YN} = m\Delta v/\Delta t = mv_n^2/r_n = ma_n;$ $a_n = v_n^2/r_n$	$\mathrm{m}a_n = -eg_n$	$(g_n = k_n \mathrm{Z}e^2/r_n^2)$ G_n and K_n are dynamic parameters (micro/variable)
3	$f_{YN}^{'} = k_nZe^2/r_n^2 = eg_n,$ $g_n = k_nZe/r_n^2;$	$a_n/g_n = -(e/m)_n$	

The field theory of physical Yi theory endows mathematical and physical space-time symbols with meaning from Yi theory, making complicated things clear and simple. The logic of the theory makes the rigorous world harmonious and ordered. Every symbol of the symmetric mathematic elements, such as addition, subtraction, multiplication, division, and calculus, is imbued with dynamic rules, such as the Yin and Yang of Yi theory, relativity, and birth and control constraints. This feature of an "unrestrained" nature is imbued by the space-time characteristics of Yi

theory and the essence of the “wave-particle-field tripartite nature” of matter. It is also because it is the source of space-time and digitized deep-layer logics of Li Yin and Yang. The field theory of physical Yi theory is an idea of traditional Eastern science. It holds that things have a kind of holographic relationship. The part reflects the whole and all types of information are agglomerated in its entirety. This is an important aspect of Yi theory that can be expressed with logical concepts and language. Yi also has another aspect, which is not included in modern empirical science. This aspect sees Yin and Yang, motion and rest, change, and repetition and circulation as all being regular and hierarchical. Different levels have different standards. The higher the level, the higher the energy, increasing the velocity.

CHAPTER 7

DERIVATION OF THE SCHRÖDINGER WAVE EQUATION

Abstract: Yi Tai Chi and Yin-Yang theory, Western complex numbers, and the electromagnetic wave function use different approaches, but yield equally satisfactory results. These approaches have been interconnected to derive and solve the compound energy spatial-temporal invariance (conservation) principle and deduce the compound energy YX equilibrium law (i.e., the Schrödinger wave equation) based on Li Yin-Yang theory, four images, and five elements. Additional principles/laws were combined to help discern the mechanism of atomic emission. An atom has a spherical shape with a center and a stable layer structure, as well as mass, electricity, and magnetism.

7.1 Energy conservation principle

7.1.1 Energy conservation principle

Table 7-1. The principle of energy conservation.

◎ Current science discusses how the universe was formed by this or that matter. A more advanced understanding holds that the universe is constituted out of time and space. The universe is fundamentally constituted of energy. The smaller the matter, the more powerful the radiation. This is the most basic rule.
◎ Matter cannot be destroyed and energy is conserved. Energy does not disappear and cannot be created. Energy can only be transformed from one form into another. ◎ The energy considered in LY theory takes five forms (energy, momentum, kinetic energy, potential energy/interactional potential energy, and electromagnetic waves). The five forms are conserved quantities, variables, and functions, and they are interconnected through the laws of energy conservation and conversion.

7.1.2 Theorem 1: Energy conservation

Table 7-2. Theorem of energy conservation.

Universal law	$\Delta \mathbf{m} \leq \mathbf{0}$ $\Delta \boldsymbol{E_k} \geq \mathbf{0}$	“No loss, no gain” energy law;
The first law of universal energy conservation	$\Delta \mathrm{V(r)} = \Delta E_k$ $\Delta E_k \geq 0$	kinetic energy theorem

The second law of universal energy conservation	$\Delta E(t, r) = \Delta E_k + \Delta V(r), \Delta E_k \geq 0$	Energy source, ethics, and practice
Magnetism-electricity equilibrium differential law	$\Delta(mv^2) = \Delta V(r)$	
Energy spatial-temporal invariance/the third law of energy conservation	①$\Delta t,\ E(t,\ r) = 0$ ②$\Delta V(r)/\Delta r = -\Delta E_k/\Delta t,\ \Delta E_k \geq 0$	Energy spatial-temporal invariance interpretation; Maxwell's magnetic force equilibrium law/equation
Compound energy temporal and spatial invariance/compound energy conservation/Theorem 4	①$A = E - [E_k + \Delta V(r)] = 0,$ ②$A\Psi = 0 \rightarrow$③$E\Psi = A\Psi$	Quantum mechanics principle interpretation Schrödinger wave equation

7.1.3 Introducing the compound energy concept

The Taoist Yi Tai Chi and Yin-Yang theory describe universal truth. Western imaginary numbers, the Yi Tai Chi, and Yin-Yang theory are different approaches to this truth, but yield equally satisfactory results. To illustrate such approaches mathematically, we need an appropriate relationship of correspondence. Chinese scholars have connected Yin-Yao and Yang-Yao from Zhou Yi Ba Gua with the imaginary and real parts of complex numbers in mathematics and applied the connection to physics in

a creative approach.

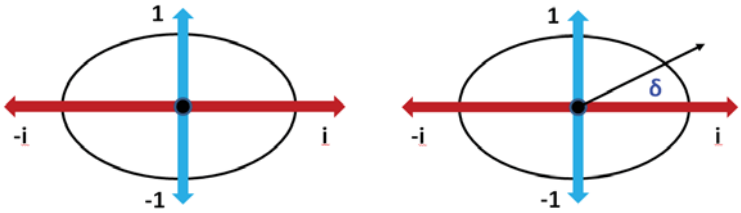


Fig. 7-1. Compound plane and vector

In mathematics, the fourth root of 1 has four solutions (1, -1, i, and -i), where i is the imaginary unit and 1 is the real number. The term "imaginary number" originates from the work of the famous mathematician Descartes in the 17th century; it was thought that this number does not exist. Later, the imaginary number was related to the x-axis of a plane and seen to exist as the real number to which it corresponds on the y-axis. The plane consists of an imaginary and real axis ("the compound plane"), with each point on the compound plane corresponding to a compound vector (as shown in Fig. 7-1) (in electronics and other relevant fields, i typically indicates current and changes to represent the imaginary unit, j). Each compound can be written as the unique vectoral sum of a real and an imaginary number.

Table 7-3. LY dynamic four images and attributes.

Yang	Energy (E)	Yin
	Momentum (p)	Yang
Yin	Time (1/T)	Yin
	Space (1/D)	Yang

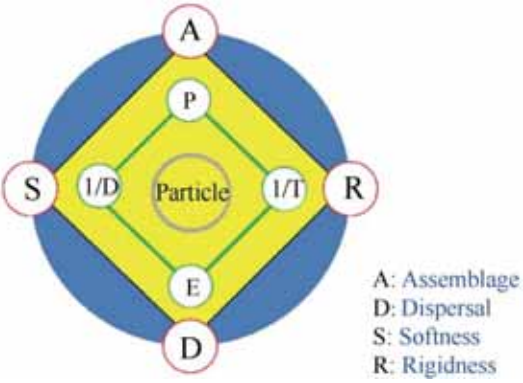


Fig. 7-2. LY dynamic four images and attributes

Coincidentally, the LY five-element diagram, which consists of a square within a circle (see Fig. 7-2), corresponds to Western physics and mathematics. Particles are everything and everything is Tai Chi; the four images illustrate mass-energy-time-space, which exist in pairs and are located in the four cardinal directions. The particle (wave-particle-field triplicity) is located at the center and reflects the apex notion of the center. The Yin-Yang concept from LY theory corresponds to imaginary-real mathematics. An electromagnetic wave with two compound vectors is a Yin-Yang pair related to the complex exponential and Tai Chi wave functions, respectively, and has the same phase angle. The imaginary number, i, has a rotation operator, which introduces Yi theory and physics and is related to compound energy.

Compound energy is the concept of refined energy. The core of quantum mechanics is the Schrödinger wave equation. The essence of the Schrödinger equation is the "who"-"wave"-"laws" connection. We have based our interpretation on time and space concepts in LY quadruplicates and Li Yin-Yang theory with four images and five elements. The Yi Tai Chi Yin-Yang theory, Western complex numbers (real/imaginary), and the electromagnetic wave function (as two compound vectors) have been

interconnected to derive the principles of quantum mechanics and the principle of compound energy spatial-temporal invariance (conservation). We further formulated and solved the compound energy YX differential equilibrium equation (i.e., the Schrödinger wave equation) and combined the results with additional principles/laws to discern the atomic emission mechanism.

7.2 De Broglie particle/wave-particle-field triplicity

The LY quaternity principle indicates that all particles, regardless of their size ("particle" referring to all things here), comprise mass-energy-time-space quaternity, which makes up one aspect of materiality; an additional aspect is the property/spiritual wave-particle-field triplicity. The wave property manifests the periodic motion of particles; the field property is exhibited through materiality and properties. Macroscopic particles with periodic motion also have a wave property (general) and de Broglie particles comprise the wave-particle-field triplicity.

Table 7-4. The algebraic relation of the wave-particle-field triplicity.

1	Space-time transformation rule	$\boldsymbol{D} = \lambda$, $\boldsymbol{T} = \mathbf{1}/\nu$($\lambda$ - wavelength, $\boldsymbol{\nu}$ - frequency, $\boldsymbol{T}$ - temporal period, and $\boldsymbol{D}$ - spatial period)
2	(Intrinsic) speed, time (T), and space (D)	$v = D/T = \lambda\nu$
3	Energy, momentum, and time-space	$E = mv^2 = h'\nu = h'/T$; $p = mv = h'/D = h'/\lambda$ Kinetic parameters: $0 \le v \le c$ $h' > h$
4	The mass-velocity-energy relationship: $m_0c^2 = mv^2 + m_0^2v^2$	$m = m_0/[(1 - v^2/c^2)^{1/2}]$; m-moving mass, m_0-static mass; m , $m_0 \neq 0$; $\Delta m \propto \Delta v$; $\Delta m_0 \propto -\Delta v$

5	Phase angle (quadruple representation)	$\delta = 2\pi(r/D - t/T)$ $= 2\pi(r/\lambda - \nu t)$ $= (p \cdot r - Et)/\hbar'$ $= k \cdot r - \omega t$
6	De Broglie particle wave function	$\Psi = \Psi(t,\ r) = \Psi_0 e^{j\delta}/(t,r)$ (two compound vectors)
7	Dualistic system$(m,\ \ M)$	$\langle m\rangle \in \langle M\vert m\rangle,\ \ m \ll M$
8	Velocity and speed are related: the velocity magnitude is the intrinsic speed, and the system field and motion status determine the direction.	

7.2.1 De Broglie particle/wave-particle-field triplicity

From the perspective of the LY time-space concept of quaternion theory, it is easy to understand the duality of the wave-particle. The time-space period is the same as the wave period, but their means of expression are different. Time is the reciprocal of the frequency and, therefore, time and space exist in the form of a field, invisible and untouchable, while mass and energy are contained within this field. Consequently, mass and energy cannot be discussed without discussing time and space. Macroscopic particles with cyclical motion also have wave properties. The electron is a relativistic particle and is relatively representative of this principle.

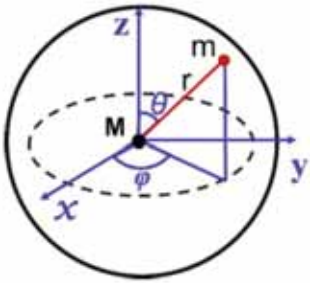


Fig. 7-3. Four-dimensional Euler polar coordinates: r = r(t, r, θ, φ) and selecting a "duality" sub-system

7.2.2 Dualistic system combined with Euler polar coordinates

Table 7-5. Dualistic system combined with Euler polar coordinates.

	Dualistic system:$\langle m\rangle \in \langle M\vert m\rangle$	Quality	Quality	Momentum
1	Nuclear particles of an atom (Yang/static), M	M	v'	Mv'
2	Random electronic particles in the potential field (Yin/moving), m	$m(>0)$	$v(\geq 0)$	mv
3	$v' \approx 0, v \geq 0; m \ll M;$			

Yi is easy and simple because it obeys the laws of the universe. Two variables are simplified into one variable and the concept of Yi is also simplified without losing sight of the principle. In the following, we indicate many dynamic algebraic relationships for electronic (moving) particles.

7.2.3 Theorem 3: Energy of orbital electrons

Table 7-6. Energy of orbital electrons and features.

1	$\boldsymbol{E = h'v = h'/T,\ p = h'/D}$	Energy is discrete; $\boldsymbol{h'}$ - Plank's constant, $\boldsymbol{\hbar' = h'/2\pi,\ h' \geq h}$
2	$E = mv^2,\ p = mv$	Velocity $v = D/T$; $ET = pD$ (conjugate relationship); $E/p = v = D/T$ (proportional relationship)
3	$E_k = 1/2mv^2 = p^2/2m$	E_k - kinetic energy (the energy required by particle motions)
4	(total) $E = mv^2 = E_k + V(r)$	$V(r)$ - interactional potential energy manifests the particle and field properties and is a central potential field.
5	$E(t,r) = E_k + V(r)$	Assimilation conditions: (i) the electron is a part of the atomic central potential field (t,r); (ii) the intrinsic speed is equal to the velocity at this location; (iii) the intrinsic energy is equal to energy at this location $E(t,r)$.
6	$E(t,r) = E, v(t,r) = v$	
7	Electron wave function	$\Psi(t,r) = \Psi_0 exp\,[i(pr/\hbar')]exp\,[-i(Et)\hbar']$ (two compound vectors)
8	Phase angle (four appearances)	$\delta = 2\pi(r/D - t/T) = 2\pi(r/\lambda - vt) = (pr - Et)/\hbar' = kr - \omega t$

*The concept of assimilation is reflected on two levels: first, the electron is originally a member of this level; second, if it originates from outside the level, it needs to comply with the standards of that level.

7.2.4 Law of complex energy conservation

According to Noether's theorem, if the law of motion is invariant (independent of time or space) under a particular transformation, there must be a certain symmetric property, a corresponding conservation law, and a pair of conserved quantities. Concerning the time-space invariance of complex energy, the following equation applies:

$$A = E - [E_k + V(r)] = 0 \qquad (7\text{-}1)$$

where E represents complex energy; E_k represents complex kinetic energy; and $V(r)$ represents the interactive potential energy between the electron particle and the nucleus. Here $A = 0$ indicates the conservation of complex energy; if a non-conservative state is present, then $A \neq 0$. The remaining question consists of calculating the expression of complex energy and complex momentum; the method is very simple.

7.3 Compound energy YX differential equilibrium law derivation

According to Theorem 3, the algebraic expression for the wave function of an electron particle is as follows:

$$\Psi(t,\ r) = \Psi_0 exp\,[i(pr/\hbar')]exp\,[-i(Et)\hbar'] \qquad (7\text{-}2)$$

7.3.1 Compound energy and compound momentum derivation

Table 7-7. The expression of compound energy.

(a)	compound energy: $E = i\hbar' \partial/\partial t$;	Imaginary number i - symbol or spin function, property: $i^{-1} = -I,\ i^2 = -1$
(b)	compound momentum: $p = -i\hbar' \partial/\partial r$;	
(c)	compound kinetic energy: $E_k = p^2/2m = (-\hbar'^2/2m)\partial^2/\partial r^2$	

(d)	compound (total) energy: $\mathrm{E} = \mathrm{E}(\mathrm{t},\ \mathrm{r}) = E_k + V(r)$ $= (-\hbar'^2/2m)\partial^2$ $/\partial r^2 + V(r)$

(a) Calculate the partial differential for $\Psi(t,r)$ with respect to t and r; the second-order partial derivative is calculated with respect to r; $\partial^2\Psi(t,r)/\partial r^2 = -(p^2/\hbar'^2)\Psi(t,\ r)$. Both ends are compared to yield $(\partial^2/\partial r^2) = -p^2/\hbar'^2$. Therefore,

$$p^2 = \hbar'^2(-\partial^2/\partial r^2);\ p = -i\hbar'\partial/\partial r \qquad (7\text{-}3)$$

(b) The partial derivative is calculated with respect to t and compared to yield $E = i\hbar'\partial/\partial t$.

(c) The compound functions p^2 and E are introduced in the energy equation, $E_k = p^2/2m$, which yields the following: $E = E(t,r) = E_k + V(r),\ E_k = p^2/2m$.

This yields the following:

$$E = \hbar'^2/2m(-\partial^2/\partial r^2) + V(r),$$
$$A = \ （A - \text{Hamiltonian energy}） \qquad (7\text{-}4)$$

Note: the transform function for the symbol i $(i^{-1} = -I, i^2 = -1)$.

7.3.2 Corresponding equilibrium law of YX compound energy

According to Noether's theorem, the wave function depends on time and space and is invariant upon transformation with a particular symmetry. Now we introduce the aforementioned compound energy:

(1) $E = i\hbar'\partial/\partial t$, and(1)′ $E = E(t,r) = E_k + V(r) = \hbar'^2/2m(-\partial^2/\partial r^2) + V(r)$) and represent the analysis as an algebraic equation for conservation: $A = E - [E_k + V(r)] = (1) - (1)'$; we then calculated the

dot product for A and the original wave function Ψ; $A\Psi = 0$. This expression can be simplified to yield the following:

$$i\hbar' \partial\Psi(t,\ r)/\partial t = \left[(-\hbar'^2/2m)\partial^2/\partial r^2 + V(r)\right]\Psi(\mathrm{t},\ \mathrm{r}) \quad (7\text{-}5)$$

$$\mathrm{E}\Psi = \hat{H}\Psi \quad (7\text{-}5')$$

Equation (7-5) represents the *YX compound spatial-temporal energy equilibrium law* and "(atomic) central potential field wave mechanic law". The left side is invariant as a function of time $E = j\hbar' \partial/\partial t$ and the right side is invariant as a function of space, $\hat{H} = (-\hbar'^2/2m)\partial^2/\partial r^2 + V(r)$.

7.3.3 The principle of energy conservation and self-similarity

The LY first law of energy reveals that the mass-energy-time-space four-image property and the wave-particle-field tripartite nature of particles are united. They are present in a certain universal system and comprise a single indispensable member. Therefore, the symmetric, harmonious, and ordered property of this system will inevitably be reflected in the particle, representing the similarity between the particle and system. In the universe, symmetry and conservation correspond to each other; when one conservation law is revealed, one pair of conservative quantities is obtained.

Regarding the principle/equilibrium law of conservation, the LY theory consists of the common model, i.e., at a certain space-time point (t,r), a specific object is characterized by the characteristic energy function $f(t,r)$ and "energy conservation" means that this function reaches the maximum value as the space-time changes:

$$\Delta t,\ f = \Delta t f + \Delta r f = 0 \rightarrow f + f' = 0\ (A = 0) \quad (7\text{-}6)$$

This equation is solved to obtain the equilibrium law, where the left side represents the time invariance and the right side represents the spatial invariance. This rule is an important basis or criterion for deciphering Maxwell's equations of magnetic-electric rotary dynamics.

For the non-equilibrium state, $A \neq 0, f + f' \neq 0$ and $\Delta\left(f - f'\right) \neq 0$, which is not discussed in this paper. Noether's theorem indicates that, in the universe, symmetry and conservation correspond to one another and when one conservation law is discovered, a pair of conserved quantities is obtained. Particles exist in the time-space field. It is necessary to search for particle properties, wave properties, and field properties to find a particle; the method used to discover discrete particles is the conservation/equilibrium law of particles, applied with respect to the space-time field.

7.3.4 Solution of the Schrödinger wave equation

Theoretical principle/law and experimental laws are not identical, but the Schrödinger equation is a special case. Here, we have corrected the name to the "Schrödinger wave equation". In China, the old saying "lucky hit" refers to this situation. According to de Broglie's statement that "a particle is a wave, and a wave is a particle", Schrödinger formulated equation (7-5) with the imaginary number i, but gave no reason for its inclusion. At that time, the scientific community, including Einstein, was very confused. This equation cannot be explained, but it is very useful. Now the puzzle has finally been solved.

The Schrödinger wave equation is a multi-element second-order partial differential equation that can be solved with the Newtonian method, solving the original equation using derivatives. For example, we introduce the potential function $V(r)$ to represent the interaction between the electron and nucleus into the centered potential field of a hydrogen atom and expand it in the Euler spherical polar coordinate system. With factorization, we can solve the wave equation (which can be found in textbooks on quantum mechanics) and derive the wave function for electron and electron-like particles as follows:

$$\Psi_{nlms}\left(t,\ r\right) = \Psi_{nlms}(r,\ \theta,\ \varphi)\exp\left[-j(E_n t)/\hbar'\right] \quad (7\text{-}7)$$

The wave function shown in equation (7-7) is an algebraic expression that reveals the wave distribution of electron energy and electron-like particles outside the nucleus of a hydrogen atom. Because the Eigenvalues of n, l, E_n, and p are unknown in this equation. It has not been combined with other laws/algebraic equations to obtain a solution. Consequently, the solution to the Schrödinger equation, $\Psi_{nlms}(t,r)$, truly reflects the wave-particle-field tripartite nature of the electron. The energy of the electron particle exhibits a quantized wave distribution within a certain range of the potential field outside the nucleus. The square of the wave function is always observed in experiments, which is the so-called probability distribution, although it is thought that the "wave function" is not related to factors of time. This leads to a conceptual confusion between Ψ and Ψ^2.

7.4 Spin-angular momentum conservation of particles

Theorem 4: LY theory states that a particle is discrete, quantized, and has an edge. This idea is proven by the spin-angular momentum conservation of the Tai Chi Yin-Yang electron pair for atomic particles. The mathematical and physical derivation is as follows.

According to Noether's theorem, if a particle is discrete, we presume that L_s is a conservative quantity and L_s is invariant with respect to time and space:

♣1. L_s is invariant with respect to time, $\Delta L_s/\Delta t = 0 \rightarrow \therefore \Delta L_s = 0$, $\Delta t \neq 0$; let $\Delta L_s = xL_s = 0$, and $L_s \neq 0$; then, the simplest situation is $x = 1 + (-1) = 0$; the spin quantum number is $m_s = \pm 1$. The spin angular momentum is also quantized, i.e., $L_s = (L_s)_n$, $n = 1, 2, 3, \ldots$

♣2. L_s is invariant with respect to space, namely, $\Delta L_s/\Delta r = 0/0$ $\Delta L_s = 0$ $\Delta r = 0$ a pair of conserved quantities should exist: the atom consists of a spherical-shaped centered shell with a radius of $r = r_n$ and the spin-angular momentum of the electron is quantized as $L_s = (L_s)_n$; $n = 1, 2, 3, \ldots$. Consequently, this notion proves that the spin-angular

momentum is conserved: for one pair of Yin and Yang electrons, their spin-angular momentum values (L_s) are equal in magnitude and act on the central axis in opposite directions; their energies are canceled out. The spin-angular momentum is conserved without changing the other conservation states of the system.

♣3. Electrons in the atom are located on the spherical-shaped shell's equipotential surface (they do not exist in the form of an electron cloud, as suggested by empirical science). There are three reasons for this phenomenon:

(1) In the same equipotential layer, two electrons carrying the same amount of negative charge will not collide because the charges repel each other, which satisfies the law of (field) momentum conservation, and electrons usually move uniformly, describing a circle around the nucleus.

(2) The adjacent electron layers (energy levels) of the central potential field repel each other because of a potential difference. Since both electrons and electron-like particles exhibit negative electricity, they will not overlap, even though the inter-layer space/potential difference is very small (the edge of the low-energy field).

(3) Since the velocity of the electron is high and the repulsive force is large at the energy level closest to the nucleus ($n = 1$), these forces are sufficient to counteract the strong absorption force of the nucleus; therefore, the electron maintains an equilibrium state. Moreover, at energy levels closer to the nucleus, the negative charge of the electron is higher and the magnetism is more significant; therefore, the screening effect on the positive electricity of the nucleus will be more significant. For $n = 1, 2, 3, \ldots$, this effect gradually declines as the edge of the low-energy field is reached.

Additionally, the Stern-Gerlach experiment found that, when the electron beam passes through a vertical non-uniform magnetic field, it is deflected at the same angle in the opposite direction, proving the existence of electron spin. In the shell layer of an atom, the negatively charged

electron moves around the nucleus, which has a positive charge; this can be viewed as a current loop and therefore a magnetic moment is produced.

Table 7-8. The relevant structural parameters or algebraic equations for a hydrogen atom.

		$r = r_n,\ L_s = (L_s)_n,\ n = 1,\ 2,\ 3 \ldots$
2	Angular momentum conservation/orbital quantization/principal quantum number n	$(1)L_n = rmv = rp = rk\hbar'$; $(2)L_n = r_n p_n = n\hbar$; United: $n\hbar = rk\hbar, n = \frac{r_n}{\lambda_n} = \frac{r_n}{D_n}$; $\therefore r_n = \lambda_n/n = D_n/n$
3	YN law of circular motion of an electron	$\frac{\mathrm{m}v_n^2}{r_n} = -\frac{kZe^2}{r_n^2}$; $\left(f_{YN} = -f_{YN}^{'}\right) r_n \propto \lambda_n, 1/n$
4	The kinetic energy of an electron	$E_k = 1/2kZe^2/r_n$ (positive value);
5	Electron (total) energy	$E_n = -1/2kZe^2/r_n$ (negative value)
6	Interactive potential energy (between the electron and nucleus)	$V(r_n) = kZe(-e)/r_n$ (negative value)
7	Differential rule of magnetism-electricity equilibrium	$\Delta E_{n'n} = \Delta_{n'n} V(r)$ (accordance)

In addition to the principle/law of complex energy conservation (the Schrödinger wave equation), we also have: the law for the uniform circular motion of electrons around a nucleus; the law of momentum conservation; the law of angular momentum conservation; the law of electron conservation; and the law of spin angular momentum conservation for a Yin-Yang electron pair. In particular, spin-angular momentum conservation can uniquely reveal the problem of electron shell distribution and quantization. Only when these six principles/laws are united can we reveal the spherical, centered, and layered shell of the electromagnetic structure of the atom.

The atom exhibits a spherical shape with a centered and layered shell, as shown in Fig. 7-4. As a structure with stable mass-electricity-magnetism, this shell has a soft outer portion and a rigid inner portion. The first characteristic structure of an atom (real particle/closed circle) is that it maintains the stability and introversion of the atomic structure; the second characteristic structure (gap particle and virtual particle/string circle) reveals the mechanism for excited radiation/absorption, the features of atoms, and maintains the stability of the atomic structure.

Fig. 7-4. The electromagnetic structure of atoms is a centered and layered spherical shell

Theorem 6: Particles (everything) have a natural instinct to maintain a balanced and stable energy state. As such, the energy emission/absorption of an atom can be seen as the manifestation of this instinct.

7.5 The law of atomic light electromagnetic radiation

Atomic emission involves the phenomenon of excited light and electromagnetic radiation. In line 7 in Table 7-8, we may note that the atomic structure complies with the differential rule of the magnetism-electricity equilibrium (Field Theory III and IV). The law/equation of electromagnetic radiation (/absorption) of atomic light is as follows:

$$\Delta E_{n'n} = \left(E_{n'} - E_n\right) = hv; \;\; c = \lambda v$$

$$\therefore 1/\lambda = \Delta E/ch = (1/ch)\left(E_{n'} - E_n\right) \qquad (7\text{-}8)$$

where $n' > n$, $|E_n| > \left|E_{n'}\right|$ $(n = 1,\ 2,\ 3,\ \ldots;\ n' = 2,\ 3\ldots)$.

Every atom has its series of characteristic spectral lines and the electromagnetic radiation of light has a common wave velocity, c, and different frequencies and wavelengths. The wave function of atomic radiation of light is expressed with complex vector as:

$$\chi = \chi(E,\ H);\;\; E(t,\ r) = E_0 e^{j\delta};\;\; H(t,\ r) = H_0 e^{j\delta} \quad (7\text{-}9)$$

where the electric vector and magnetic vector are perpendicular to each other and have a common phase angle.

$$\delta(t,\ r) = 2\pi(r/\lambda - vt) = 2\pi(r/D - t/T) = (pr - Et)/\hbar = kr - \omega t \qquad (7\text{-}10)$$

where λ is the wavelength; v is the frequency; and (t,r) is the space-time of carrier/environmental time-space. The phase angle has four different forms of expression. These are the wave properties of the light particle, the particle properties, energy properties, and rotary circular periodicity, which reflect the wave-particle-field property of electromagnetic particles and the

state of rotary circular periodic motion. Atomic radiation is one type of electromagnetic radiation of light. The electromagnetic radiation of light has a standard wave velocity, c, and different frequencies and wavelengths.

Regarding the wave energy distribution of electrons and electron-like particles as revealed in the atomic structure, the extra-nuclear negative charge layer and wave function of electrons and electron-like particles on different energy levels and the energy distribution are the manifestation of the wave and the field. It should be particularly emphasized that, for the wave function of extra-nuclear electrons and electron-like particles shown in equation (7-7), the electric vector, E, and magnetic vector, H, are perpendicular to each other and the phase angle has a similar form:

$$\delta(t,\ r) = 2\pi(r/\lambda - vt) = 2\pi(r/D - t/T) = (pr - Et)/\hbar = kr - \omega t \qquad (7\text{-}10')$$

and, $\hbar' > \hbar$, and $v < c$.

Many aspects listed above will likely be very difficult to rationalize using the notions of empirical science. This is because empirical science emphasizes experiment and measurement, and high-energy physics is used to disintegrate atoms; however, the electron beam can be measured. As mentioned in the section on magnetic charge theory, an electron's charge properties are strong, while its magnetic properties are very weak. Although these properties are too weak to be measured, this does not mean that they do not exist.

7.6 Connotation of the laws of physics

Let us discuss three main points in the following.

7.6.1 The corrected name of the Schrödinger wave equation

In this paper, based on the principle and law of complex energy conservation, we have adopted the derivative/calculus method to derive the YX differential law/equation of complex energy equilibrium in only three

pages. This equation is identical to the Schrödinger wave equation. In 1926, in response to the statement of de Broglie that "a particle is a wave, and a wave is a particle", Schrödinger formulated an equation with an imaginary number, i, which is actually "the wave equation of (electrons) particles". As a result, the "haze" that has enveloped the Schrödinger equation in the past century, including the confusion of paired operators, Schrödinger's cat, and the conceptual confusion between Ψ^2 and Ψ, ceases to exist. The wave function of (electrons) particles $\Psi(t,r)$ is called the holographic wave function and it offers a comprehensive description of the existence of the particle state.

7.6.2 Eight rigid dialectics

The LY eight-rigid dialectics offers an outline for the classification of all things. The eight rigid dialectics consist of Yin and Yang, motion and rest, cohesiveness and divergence, and rigid and soft states. They are paired in Yin and Yang, with Yin and Yang as the general principle. Yin hides and Yang appears; mass is cohesive and energy is divergent; magnetism is cohesive and electricity is divergent; and Yang is rigid, while Yin is soft. In the LY four-image theory of dynamics, energy (E) and momentum (p) is one pair of Yin and Yang, while time $(1/T)$ and space $(1/D)$ are another pair of Yin and Yang. Energy and momentum are often inseparable and they emerge in various laws. Magnetism and electricity also form one pair of Yin and Yang. The dialectics of Yin and Yang and motion and rest are related to the system of observation. In terms of the earth and the sun, the sun rests as Yang, while the earth moves as Yin; for the electron and the nucleus, the electron moves with the property of Yin, while the nucleus is at rest with the property of Yang.

In this paper, the law of atomic light electromagnetic radiation $\left[\Delta E_{n'n} = \Delta_{n'n} V(r)\right]$, involves two work functions; the first is

the work of electric force, $\Delta E = (Fv)\Delta t \rightarrow (\Delta p/\Delta t)(\Delta r)$, as shown in Feynman's work-energy equation (3-1) in Field Theory II. From the perspective of Yin-Yang properties, the left side represents $\Delta E \rightarrow$ electricity/Yang/motion and the right side represents the work of magnetic force $\Delta V(r) = f_{YN}^{'}(-\Delta r)$, as shown in equation (4-5) in Field Theory III. From the perspective of the Yin-Yang property, $\Delta V(r)$ is the magnetic property/Yin/cohesion. Why do we need to make this differentiation? Because there is no such thing in modern empirical science, but these concepts are fundamental and important. However, they are seldom mentioned in general discussion of this area.

7.6.3 From specificity to generality

The time/space field of the particle is invariant and occupies a certain time-space range. LY theory considers the spin angular momentum conservation of (electrons) particles as the fifth principle/law; this is axiomatic. The reason for this is as follows: the spin-angular momentum of the south and north poles of the earth are equal in magnitude and act on the geomagnetic axis in opposite directions to maintain angular momentum conservation at the center of the earth; this can be described as both opposite and complementary. The oceanic circulations in the southern and northern hemispheres of the earth are opposite in direction and change according to the earth's rotational direction from west to east near the equator, which indirectly confirms this fact. That is to say, in the universe, any spherical moving object follows the rule of spin-angular momentum conservation. Generally, any particle has a field range with time and space invariance, which is called impenetrability. An atom is similar to a small solar system: the nucleus is at the center (equivalent to the sun) and it is surrounded by electrons around the nucleus, similar to the planets (such as the earth).

7.7 Particle Yin-Yang four-image and five-element diagram

The five-element theory of China has been recognized by modern science. For example, the periodic table of elements that we are familiar with is classified into “five elements”, consisting of the traditional four images of gold, wood, water, and fire in China, with soil at the center. All things in the world are composed of molecules and atoms on the microscopic scale and they are the basic materials that constitute everything in the world. All things in the world are constructed according to different arrangements and combinations; this is not a coincidence. On a deeper level, the material structure constitutes five types of elements, representing the LY mass-energy-time-space four-image and five-element theory. The four images are mass, energy, time, and space, which correspond to each other in pairs and are located in the four cardinal directions. A particle (the property of the wave-particle-field tripartite nature) is at the center, reflecting the idea that the object in the center is important.

Table 7-9. The LY four-image and five-element theory.

1 (First principle of energy) Principle/law of mass-energy-time-space four-image property:	particle/property oneness
2. Active and interactive potential/principle/law of force equilibrium	particle-field
3. YN principle/law of field momentum conservation	particle-field
4 YX principle/equilibrium law of complex energy conservation	particle wave-field
5. A particle (wave-particle-field tripartite-nature) is in the center, which reflects the idea that the object in the center is important.	

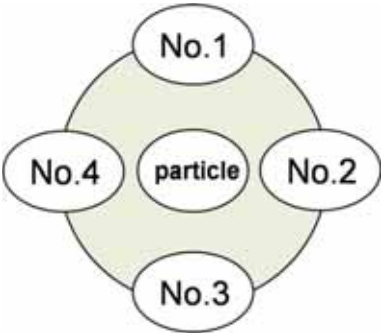


Fig. 7-5. Four-image and five-element diagram of Li Yin and Yang.

The physical field theory of Yi theory is based on the traditional Eastern philosophy of Yi theory and LY five-element theory. It integrates the rational achievements of Western natural science and forms the LY space-time concept in the theory of quaternions. Using the four fundamental principles (the LY/principle of mass-energy-time-space four-image property; followed by the LY field momentum/conservation; the LY action/interaction; and the LY energy/conservation principles), as shown in Fig. 7-5, we can apply the basic philosophy of dynamics, including "matter, movement, space-time, energy, force, and equilibrium" to elaborate the so-called principles/laws and rules in a concise mathematical and physical model. Using the time-space principle of mathematics, the method of primary derivative/calculus, and the deductions of Newtonian mechanics, relativity, and quantum wave dynamics, we can reveal the nature of the property of the wave-particle-field tripartite-nature. Maxwell's electromagnetic equations can be interpreted using this procedure, in which spirit and matter are combined to achieve the Yi theory of a united field.

CHAPTER 8

THE FOUR-ELEMENT TIME AND SPACE CONCEPT

Abstract: The field theory of physical Yi theory integrates Western physical scientific field theory with the principle of the four images and five elements of Li Yin and Yang to establish a new theoretical system. This field theory includes several fundamental principles and laws and can effectively combine the core components of existing electromagnetic theory, relativity, quantum theory, and Newtonian mechanics. The theory of a four-image multi-dimensional space-time concept allows these core components to be combined with consistent logic.

8.1 The energy conservation principle

8.1.1 Theorem 1: Energy law

Matter and spirit are united and share the same nature. The tripartite nature of particles, i.e., the wave-particle-field trinity, reveals that a particle is a wave, and once there is a wave, there is spin. The holistic nature of particles is expressed by the particle wave function, which is also called the holistic wave function. The wave function of a particle is a complex binary vector: $\Psi(t,r) = \Psi_0 e^{i\delta}$. A particle has four images, i.e., four appearances. Its wave function has four modes of expression, which correspond to these

four appearances: particle characteristics, wave characteristics, energy characteristics, and rotational periodicity.

The de Broglie wave is given by $\delta = 2\pi/h'\ (pr - Et) = (pr - Et)/h$. Here, energy, E, and momentum represent particle properties and wave properties, such as the wavelength and frequency of the time-space period. Among the expression of four types of phase angles, the time and space variables of the medium (t, r) are always involved. Moreover, p, r, and the space (field) period of particles (D) can all be vectors, which is very important to note. Nevertheless, for functions that change with time and functions that change with space, there is no essential difference in the regularity of the phase angle. That is, space period (D), time period (T), space frequency $(1/D)$, and time frequency $(v = 1/T)$ are two different expressions of the same concept. This has been fully explained from the perspective of Fourier optical communication and through the application of photography.

Table 8-1. Wave characteristics of moving particles and the space-time of the medium.

Mass-energy-time-space four-image nature of particles and dynamic four-image nature			**The complex phase angle of waves (ejδ)**	**Time-space characteristics of a medium**
1	Time-space period $(T,\ D)$	$v = 1/T,$ $\lambda = D$	$\delta = 2\pi(r/D - t/T)$	$(t,\ r)$ Time-space period $u(0 \le u \le c)$
2	Wave period $(v,\ \lambda)$	velocity: $v = D/T = \lambda v$	$\delta = 2\pi(r/\lambda - vt)$	$h' \geq h;\ h'/2\pi = \hbar'$ h - Plank

3	Energy	$\mathrm{E} = \mathrm{m}v^2 = h'/T = h'v$	$\delta = 2\pi/h'$ $(pr - Et) = (pr - Et)/h'$	constant
4	Momentum	$p = mvh'/D$		
5	Angular time-space frequency	$\omega = 2\pi/Tk = 2\pi/D$	$\delta = kr - \omega t$	$v = \omega/k$, $(0 \leq v \leq c)$
6	particle wave function	$\Psi(\mathrm{t},\ \mathrm{r}) = \Psi_0 \exp\,[i2\pi(r/\lambda - vt)]\Psi_0 e^{i\delta}$		

8.1.2 The effect of waves and the resonance dynamics of matter

In everyday life, if something is dropped on the stairs, people hear the sound from upstairs. Particles with sonic frequency emitted from the sound source propagate in the form of waves and reflect when they encounter a barrier. The frequencies of the reflected wave and the incident wave superimpose in amplitude, leading to an amplified reflected wave; this phenomenon is called vibration/resonance in physics. More generally, in Yi theory, it is known as Yin and Yang harmony or allelopathy. In physics, the prerequisite for resonance is that two waves with the same source, same frequency, and same phase meet. Their amplitude vectors superpose; the intensity of the resulting electromagnetic wave increases with the square of the amplitude. Smaller particles have higher (complex) energy (reciprocal of time) and higher (complex) momentum (reciprocal of space). The resonance effect is an effect of the complex spatio-temporal energy field and it is very powerful, indeed, it is indispensable for all things in the universe.

Liyi theory agrees with the concept of matter waves as proposed by de Broglie. Waves accompany all matter, and the movement of the matter and

the spread of the wave cannot be separated. Wave characteristics are features that are owned only by “light”, but are shared by all 106H particles, even particles that also exhibit the wave characteristics of 107H particles. This is the “tripartite wave-particle-field nature” of 108H Liyi theory. The waves of all types of matter have resonance characteristics. When two waves with the same wavelength meet, their superposition occurs. The 109H amplitude increases; the principle of resonance also arises in sonic waves, 110H electromagnetic waves, and other matter waves, this being a universal principle of nature. In the amplitude (vector) superposition, the intensity is the square of the amplitude (scalar); the former is embodied in complex space-time. This principle can be applied to identify whether one kind of wave is identical to another type of wave; if they are identical, then resonance occurs, otherwise no resonance will be observed. When there is no resonance, the intensities merely add.

8.2 Four-element multi-dimensional time and space concept

From the perspective of Li Yin and Yang’s four-image nature, a particle has the basic properties of mass, energy, time, and space, reflected in its four images. Velocity is a space/time ratio, whereas frequency is the reciprocal of time and wavelength is the periodic length of space. From a practical perspective, a particle’s space field has dimensions and a shape and can be expressed with vectors. Other corresponding physical quantities, such as momentum and velocity, can also be expressed with vectors. The time and space concept of Liyi is related to Einstein’s four-dimensional time-space concept.

According to the Li Yin and Yang relativity principle, the propagation of electromagnetic particles in space must occur in a carrier medium. This carrier medium has particular features of mass-energy-space-time. Motion is Yang, while rest is Yin—motion and rest and Yin and Yang are relative

and dynamic. The dynamic four-image feature of a moving particle has been previously mentioned; the time-space variables of a resting object are denoted by (t,r) and its velocity is denoted by u, thus the wave equation (for waves such as light waves and sound waves) can be expressed as follows: $H = H_0 e^{j\delta}$, where δ is the phase angle. The wave equation consists of two components: amplitude and phase.

Electromagnetic particles and their transfer/carrier medium constitute one pair of Yin and Yang: the particle is Yang and the medium is Yin. For Yin and Yang and for moving objects and resting objects (true or false), there is a dynamic Yin and Yang relationship. They are dependent on each other; Yin and Yang exist in a relationship of promotion and restraint. The relationship among the space-time concept of Liyi theory, the phase-angle function of a wave and the four-image property of a particle is as follows: time and space form one pair of Yin and Yang that is independent and correlated. A time-space pair has size or length, i.e., mass and energy. As shown in Table 8-2, for (1) moving objects (motion) and (2) their medium/carrier (rest), the attribute of moving objects is Yang and the attribute of resting objects is Yin; Yin is implicit, whereas Yang is explicit, and two binary multi-dimensional space-time factors are united to constitute the four-element multi-dimensional space-time theoretical system. Here, "four elements" means two pairs of space-time variables, which are four physical quantities that can vary independently: "dimension" implies length and "multi-dimensional" implies multiple different lengths without quantity or calculation.

The forms of the expressions in Table 8-2 clearly demonstrate the above observations. There is a corresponding relationship between the space-time period, the wave period, and the mass-energy period in terms of the (t,r) period of a medium. These constitute four different forms of wave functions. The principle of relativity reveals the dual wave-particle nature of Li Yin and Yang. The phase angle of the wave function has two fundamental forms of expression: the explicit space-time period and a wave function that periodically varies with time/space, with $(\lambda = D),\ v = 1/T$.

The Li Yin and Yang four-image principle reveals the mass-energy-time-space four-element theory, and the wave function explicitly contains the energy period. We can derive the wave function with energy as the period. From the perspective of the wave function, these four different forms of expression are equivalent. Therefore, regardless of the vastness of the universe, it is a harmonious and ordered system. This is a fundamental premise; otherwise, there would be no regularity to be explored.

Table 8-2. The four-element multi-dimensional theory system of Liyi theory and construction of the wave function.

1	Moving object/Yang/motion: binary and four images	1) Binary time-space: $(D,\ T),\ \lambda = D,\ \nu = 1/T,\quad k = 2\pi/D,\ \omega = 2\pi/T$ 2) Four images and their correlation: $E = mv^2 = h'/T = h'\nu,\ p = mv = h'/D = h'/\lambda,\ v = D/T = \lambda\nu$	
2	Medium (or carrier)/Yin/rest: binary and four images	1) Binary time-space: $(t,\ r)$ 2) Four images of the medium and their correlation	
3	Four-element multi-dimensional wave function $\Psi(t,\ r) = \Psi(r/D,\ t/T)$ (tripartite wave-particle-field nature)	1) $\Psi(t,\ r) = \Psi_0 \exp\left[i2\pi(r/D - t/T)\right]$	$(D,\ T),\ (t,\ r)$
		2) $\Psi(t,\ r) = \Psi_0 \exp\left[i2\pi(r/\lambda - \nu t)\right]$	$\lambda = D,\ \nu = 1/T,\ (t,\ r)$
		3) $\Psi(t,\ r) = \Psi_0 \exp\left[i(pr/\hbar')\right]\exp\left[(-iEt)/\hbar'\right]$	$E = h'/T = h'\nu;\ p = h'/D = h'/\lambda;$
		4) $\Psi(t,\ r) = \Psi_0 \exp\left[i(kr - \omega t)\right]$	$k = 2\pi/D,\ \omega = 2\pi/T,\ (t,\ r)$

4	All types of time-space concepts and different observation systems and methods	1) Tai Chi Yin and Yang concept of time and space 2) Time-space concept of complex energy 3) "Yin and Ying, and motion and rest" time-space concept	Tai Chi Yin and Yang symmetry and its variations Principles of quantum mechanics Fundamentality, practicality, and the reference frame

Regarding the theory of the four-element multi-dimensional time-space concept in Liyi theory, according to the forms of expression of the four wave functions listed in Table 8-2, they are linked by certain relationships. Hence, we can derive three different time-space concepts related to observation systems or methods: the Tai Chi time-space concept; the quantum complex-energy time-space concept; and the practical "Yin and Yang, motion and rest" time-space concept. In the following sections, we will describe these concepts individually. From their names, the first two concepts are clear and straightforward. The time-space concept of "Yin and Yang, motion and rest" emphasizes the three aspects of "practicality, fundamentality, and the reference frame". It directly reveals the prominent features of the field theory in physical Yi theory and "opens the door to reveal the mountain" by including the essence of "Yin and Yang, motion and rest" from the very beginning. For the study of each system, we will first select a representative binary system. Here, "binary" refers to the concepts of (1) moving objects (motion) and (2) medium/carrier (rest) expressed in Table 8-2. The attribute of moving objects is Yang, while the attribute of resting objects is Yin; Yin is hidden and Yang is visible. Moving particles invoke the essence of the four-image mass-energy-time-space property and resting objects (relative to moving objects), namely, the carrier/medium, also invoke the essence of the four-image mass-energy-

time-space property; the four images of Yin and Yang differ, but exhibit a certain degree of connectivity, reflecting the fact that “Yin and Yang are independent but correlated”. The fact that “Yin is implicit and Yang is explicit” also poses a prominent problem. Empirical science emphasizes only moving objects/Yang because they are obvious and visible, whereas the Yin aspect is neglected because it is hidden. “One Yin and one Yang is the rule” and Yin and Yang are one rather than two. Empirical science creates a massive obstacle for itself that hinders the understanding of the objective world, including in relation to our bodies.

The above discussion refers to the fundamental and practical aspects of Yi theory as “Yin and Yang, motion and rest” and the field theory of Liyi theory, respectively; these theories are important, although they are now only concepts. Regarding the reference frame, in Newtonian physics and relativity, a particular reference frame is chosen for each specific question; otherwise, there is nothing to discuss. By contrast, in the field theory of physical Yi theory, the superficial time-space for the existence of human beings is selected as the reference frame. Although this is a macroscale, low-energy time-space also exists within a confined range; therefore, it will not affect the essence of the problems discussed.

8.3 Tai Chi Yin and Yang time-space concept

8.3.1 Tai Chi Yin and Yang time-space concept

In the history of science, the correct space-time concept of the universe was determined in the ancient science of China. The ancient people of China believed the “universe” and “time-space” to be real and independent occurrences, rather than simply abstract concepts. The traditional five-element theory of Yin and Yang constitutes this ancient physics and can be used to describe everything and the regularities of its variation. Development proceeds in a specific time and space, and time and space are

one form of the development and variation of everything. Without the motion of matter, time and space do not exist at all.

The four-element multi-dimensional wave function presented in Table 8-1, which contains the concept of complex time-space or complex energy, refers to the traditional Tai Chi diagram of the "Yin and Yang fish". Here, the two components of the regular periodic variation of the Tai Chi Yin and Yang fish are expressed by a complex wave function as follows:

$$\Phi(\cos\delta\,,\ \ \sin\delta) = R\cos\delta + iJ\sin\delta \qquad (8\text{-}1)$$

where $R\cos\delta$ and $J\sin\delta$ represent the real part and imaginary part, respectively, of the Tai Chi wave function; the phase-angle function still has four forms of expression:

$$\delta = 2\pi(r/D - t/T) = 2\pi(r/\lambda - vt) = (pr - Et)/\hbar' = kr - \omega t \qquad (8\text{-}2)$$

As advocated in the Tai Chi time-space concept of Liyi theory, the Tai Chi diagram manifests the oppositional, unified, complete, and moving regularity of Yin and Yang variation and emphasizes the overall dynamic equilibrium and harmony.

8.3.2 Quantum concept of complex energy and space-time

Nothing exists in isolation. According to the Li Yin and Yang relativity principle, the propagation of light/electromagnetic-wave particles in space must occur in a carrier medium. The carrier medium possesses certain mass-energy-time-space properties: moving objects are Yang, while resting objects are Yin; motion and rest and Yin and Yang are both relative and changing. The objects of existing superficial time and space can be regarded as a system with integrality. In Table 8-2, we have decomposed the de Broglie wave function in the product of two complex factors corresponding to time and space:

$$\Psi(t,\ r) = \{\Psi_0 exp[i(pr)/\hbar'\,]\}exp[i(pr)/\hbar'\,]$$

$$\left\{\Psi_0 exp[(-iEt)/\hbar^{\boxtimes}]\right\} exp[i(pr)/\hbar^{\boxtimes}] \quad (8\text{-}3)$$

We can calculate the partial differential of equation (8-3) with respect to t. Then, we can further compare the two sides to solve for complex energy, E:

$$\mathrm{E} = i\hbar' \partial/\partial t \quad (8\text{-}4)$$

Moreover, we can calculate the partial differential of equation (8-3) with respect to r, $\partial\Psi(t,\ r)/\partial r = -jp/\hbar' \Psi(t,\ r)$, and compare the two sides to derive the complex momentum, p:

$$p = -i\hbar' \partial/\partial r \quad (8\text{-}5)$$

As such, we can calculate the partial differential of an electromagnetic particle's wave function with respect to time to derive its complex energy; besides, we can calculate the partial differential with respect to space to derive the complex momentum. These are the core physical quantities required in quantum mechanics to construct Schrödinger's equation (as discussed in another paper). The following section compares the complex energy and complex momentum with the energy and momentum of the tripartite nature of the wave-particle-field discussed previously, as shown in Table 8-3.

Looking at the comparison shown in Table 8-4, we can observe the following:

1) If the matter is more macroscopic, then its particle nature is more prominent; if the matter is more microscopic, then its wave periodicity is more prominent.

2) Complex energy and complex momentum are inversely proportional to the differential amounts of variation in time and space, respectively:

$$E \propto i\partial/\partial t,\ \ p \propto -i\partial/\partial r$$

This equation indicates that these physical variables are more strongly focused on microscopic effects. Thus, when ∂t (i.e., Δt) and ∂r (i.e., Δr) are smaller, the effects are more microscopic; when they are larger, the effects are more macroscopic. If the effects are more microscopic, then the

complex energy and the periodicity of the complex momentum is more pronounced; the inverse relationship also holds.

3) Concerning the relationship of Newtonian field dynamics, force relates to the temporal rate of variation in momentum. Complex energy and complex momentum exhibit two types of dynamic factors that could be regarded as the dynamic essence of "quantum" behavior. A greater emphasis is placed on dynamic equilibrium, harmony, periodicity, and regularity from the microscopic perspective.

Table 8-3. Multiplicity and its meaning for (complex) energy.

Particle properties (tripartite wave-particle-field nature)	$\boldsymbol{E = h'v = h'/T}$, $\boldsymbol{p = h'/D}$ $\boldsymbol{E = mv^2 = pv}$, $\boldsymbol{p = mv}$ Wave equation: $\Psi(t,\ r) = \{\Psi_0 exp[i(pr)/\hbar'\ ]\} exp[i(pr)/\hbar'\ ]$	$\boldsymbol{ET = pD}$ (conjugate relationship) $\boldsymbol{E/p = v = D/T}$ (proportional relationship)	Energy is discrete, $\boldsymbol{h'}$ (work) is a dynamic parameter
Complex time-space and complex energy	Complex energy: $E = i\hbar'\,\partial/\partial t$, Complex momentum: $p = -i\hbar'\,\partial/\partial r$ Energy and temporal variation rate: $E \propto i\partial/\partial t$	$E\partial t \neq p\partial r$ (non-conjugate) $E/p = -\partial r/\partial t$ (non-proportional) 1) Microscopic dynamic phenomena and the essence of quantum mechanics. 2) $F \propto \Delta p/\Delta t$ (the time-varying	

	Momentum and rate of spatial variation: $p \propto -i\partial/\partial r$ Momentum and rate of spatial variation:	rate of momentum is the force).

Table 8-4. Wave and phase angle in time-space of moving objects (T, D) and media (T', D').

Selection of binary system	**Time-space period, velocity/range**		**Matter space/phase angle**	
Moving particle/motion/Yang	T, D	$v = D/T$ $(0 \leq v \leq c)$	$(t,\ r)$	$\delta = 2\pi\ (r/D - t/T)$
Carrier (medium)/rest/Yin	T', D'	$u' = D'/T'$ $(0 \leq u' \leq c)$	$(t',\ r')$	$\delta' = 2\pi\ (r'/D' - t'/T')$
Yin and Yang and motion and rest state energy interactions. Harmony leads to promotion, whereas a lack of harmony leads to restriction.				

8.4 The reference space-time frame

The main goal of science is truth. A time-space reference frame that is superficially apparent must be selected to explain human existence and

observe the world. This should not be criticized, as long as our current understanding does not limit our study. However, this material world of humankind's existence is a superficial macroscopic world with low energy and is composed of large particle clusters of molecules that can be observed. The energy in different time and space frames is different. At a more microscopic frame, the energy is stronger and there is a time-space transformation between the energies in the time and space of individual layers. The personal matter field of a human observer changes with the state of that person's spirit and body. In contrast, the whole or partial matter field of humankind will also alter with specific changes in astronomical phenomena.

8.4.1 Selection of a practical binary system

According to the four-element multi-dimensional time-space concept in Liyi theory, a particle possesses time and space. As long as the particle exists, it must have a carrier medium, whether it is moving or in a resting state. This medium is also a particle with mass-energy-time-space characteristics. The particle and the carrier medium constitute a pair in a Yin and Yang relationship—the moving object is Yang and the resting object is Yin. Yin and Yang and motion and rest are relative and vary to maintain the dynamic equilibrium and harmony of the whole. For example, the function of a vehicle is to transport heavy loads. As such, the bottom of the vehicle is equipped with wheels that can roll, similar to wave behavior. Between the vehicle and the road surface a Yin and Yang/motion and rest relationship is established. The road surface is the medium/carrier of the vehicle waves, where the vehicle's motion is Yang and the rest of the road surface is Yin. Light and sound can propagate in realistic time and space; for this purpose, a medium that can carry waves is required. The time and space of different media overlap because of the diversity of time and space. In other words, the time-space media of different moving objects, such as

vehicles, light, or sound, are different, and they each travel without interference. The field of matter is hierarchical; however, a relationship may arise between levels that are hierarchically close under certain time-space conditions.

Every object and phenomenon has its essence; thus, everything has both Yin and Yang. A solitary Yin does not grow, whereas a solitary Yang will grow. Yin and Yang are integrated and supplement each other; thus, they are harmonious and ordered. In this material world, everything possesses basic mass-energy-time-space properties and corresponding Yin and Yang relationships. Everything exists in a relative sense and participates in the relationship between Yin and Yang, which is the relationship of promotion and restraint—Yin is at rest, while Yang is in motion. Mass and energy possess the properties of aggregation and dispersion, and time and space possess the characteristics of rigidity and softness. Aggregation and dispersion are consistent, and rigidity and softness are complementary. This is the aspect of harmony and order; there is also a change in the opposite direction when such aspects become extreme, reflecting relativity. This is the basis for the "rule of Yin and Yang, motion and rest". A binary system chosen in this manner complies with the aforementioned four-element multi-dimensional time-space (concept) theory of Liyi theory. It contains the factors of Yin and Yang and motion and rest, which are both independent and correlated. Any space within the same level is similar to the matter space that we currently inhabit.

8.4.2 The "Yin and Yang, motion and rest" rule and adaptability

A wave is a manifestation of Yin and Yang, and motion and rest have an interactive relationship. Yang propagates in Yin and the states of both motion and rest exist. These motion and rest states are ordered and Yin and Yang supplement each other with interactive constraints. There is an

interactive energy exchange between Yin and Yang. Wave properties are a manifestation of the periodic motion or oscillation of objects, as well as a manifestation of energy. Because of the equivalence of energy, frequency, and velocity, a type of medium that transfers waves must also have the corresponding structural characteristics of periodic oscillation. The following concept of adaptability describes the relationship of dynamic relativity (promotion and restraint) for moving objects and resting objects. Based on the wave properties of moving particles and the space-time medium, as shown in Table 8-4, we select a binary system following the rule of "Yin and Yang, motion and rest". Regardless of the wave type (low frequency or high frequency), it can be expressed by a wave function of the same form. Any moving object, including sound waves, exhibits wave-particle duality with velocity, $v(0 \le v \le c)$. Such an object has a specific frequency and wavelength. Its periodic phase angle δ is a function of (t, r) and can be written as follows:

$$\delta = 2\pi(r/D - t/T) \qquad (8\text{-}6)$$

where the temporal period of the particle motion is T; the spatial period is D; and the velocity is equal to the ratio between these spatial and temporal periods, $v = D/T$. These physical quantities, which reflect the intrinsic properties of a moving particle, do not change with the time-space variables (t, r) of the medium. The condition for the unchanged periodicity of the phase in equation (8-6) is δ = constant. By differentiating both sides and setting the result to zero, the following is obtained:

$$\Delta\delta = 2\pi(\Delta r/D - \Delta t/T) = 0 \rightarrow \Delta r/\Delta t = D/T = v \qquad (8\text{-}7)$$

As seen in Table 8-5, if the velocity of an object at rest is $u' = D'/T'$ and if D' and T' are spatial and temporal periods, respectively, then the time and space variables in the matter-space are (r', t') and the phase angle is $\delta' = 2\pi(r'/D' - t'/T')$. Similarly, the following is obtained:

$$\Delta\delta^{\boxtimes} = 2\pi(\Delta r^{\boxtimes}/D^{\boxtimes} - \Delta t^{\boxtimes}/T^{\boxtimes}) = 0 \rightarrow u^{\boxtimes} = \Delta r^{\boxtimes}/\Delta t^{\boxtimes} = D^{\boxtimes}/T^{\boxtimes} \qquad (8\text{-}8)$$

Because the sizes of space and time fields for moving and resting objects may be different, there may be a duality in their velocities, with the velocities either being equal or nearly equal ($u' = v$) or being distinctly different ($u' \neq v$). For example, sound (matter waves on the molecular level) propagates in the air (as matter on the molecular level), while light propagates in the medium of free space. The range of variation for the velocities of these types of moving object (Yang) can be very large ($0 \leq v \leq c$). For particles with a definite wave velocity, v, the range of variation for the velocity of the medium/carrier (Yin) can also be very large, ($0 \leq u' \leq c$). Besides, because of the equivalence of energy, frequency, and velocity, such a periodic medium can transfer motion as a wave; for example, the wave property of a vehicle must match the medium's wave property (the road). There is one type of Yin and Yang relationship between a moving object and its propagation medium. The moving particle is Yang (moving) and the medium carrying the motion is Yin (resting). Yin and Yang are interdependent and restrict each other. The dynamic relativity between moving objects and resting objects, or the promotion-restraint relationship, is called adaptability. Adaptability represents the relative correlation between moving objects and carrier-medium particles and can be expressed in terms of the velocity ratio, n, between the particles:

$$n = v/u \quad (8\text{-}9)$$

where v is the velocity of moving particles (Yang) and u' is the velocity of the matter of the carrier medium (Yin). The adaptability (i.e., the velocity ratio) between Yin and Yang and between moving and resting objects can be roughly divided into three regimes:

(1) The velocities are in harmony, $n = v/u' \approx 1$. For example, light propagates in the medium of free space ($v = u' = c$).

(2) The velocity of a moving object is higher than the velocity of the carrier, $n = v/u' > 1$. For example, when light propagates from an optically thinner medium into an optically denser medium, the propagation of the refracted light (u) is slower (corresponding to the index of

refraction in optics, which will be discussed later). Note that the propagation speed of refracted light, rather than its velocity, is lower; velocity is an intrinsic physical quantity of the refracted light and is not easily changed, although it may change under certain special conditions.

(3) The moving objects are restrained, $n = v/u' < 1$, and the energy of the moving objects is lower than that of the carrier; thus, the moving objects will be restrained and prevented from passing through the medium. For example, sound can propagate in air, but cannot propagate in free space. Light can propagate in free space, but cannot propagate in a "black hole". The mechanism is the same; a black hole is a region of high-energy matter.

In summary, any object or phenomenon has a specific and intrinsic nature. Everything exists relative to particular Yin and Yang relationships, namely, relationships of promotion and restraint. The spatial environment has constitutional components of matter and is not a simple environment. Nothing can exist without a foundation consisting of an environment of substance. In the four-image concept, the four images of "mass, energy, time, and space" are fundamental elements and are present in everything. They are both indispensable and different from each other, as a manifestation of the independence the four images. The energy, momentum, and time-space fields are connected through velocity, which manifests the connection between the four fundamental elements. There is a solidarity relationship between moving particles and their environment. There is a Yin and Yang relationship between moving objects and their medium of propagation; the moving particles are Yang, while the medium that carries the motion is Yin. Yin is at rest, while Yang is moving—Yin and Yang depend on and restrain each other. Therefore, this Yin and Yang relationship is also a dynamic relationship. In the process of the variation of motion, whether the object is moving or at rest, an energy exchange occurs. This exchange must remain harmonious or there will be more or less energy in the final state than in the initial state. More energy is excessive, meaning that the potential and force both exceed their intrinsic energies. Less energy

is insufficient, meaning that the inherent properties of the object cannot be released. According to the theory of adaptability between Yin and Yang and between motion and rest in Liyi theory, the law of the derivation of refraction is simple. For relativistic particles and low-velocity particles, we can perform a similar justification by replacing c with the velocity (v) to derive an identical result.

8.5 The limitation of human eyes

The understanding of time and space based on empirical science extends only from points, lines, planes, and volumes in geometric space to (3+1)-dimensional time and space. In other words, Newton's concept of time and space and Einstein's concept of a four-dimensional space-time constitute the real time-space component of the Tai Chi Yin and Yang concept of time and space—the presence of time and space is ignored because it is "invisible". The human ability to perceive the objective world relies too much on vision. The function of the human eye is similar to that of a camera lens. Modern optical devices can capture only the intensity of electromagnetic waves (the square of the amplitude) and cannot capture information on the phase angle. Moreover, human eyes are composed of low-energy matter on the molecular level and what we can see is merely electromagnetic waves of matter in a narrow spectral range of 400 to 700 nm. There are also differences in time and space that human eyes cannot observe or that can only be detected by modern scientific approaches. However, this does not mean that such differences do not exist. Human sensory organs restrain and determine human perception: are things that are invisible or untouchable outside the bounds of science? The definition of empirical science is not fully scientific and is thus incomplete. The eyes of flies are considered large and to consist of many compound eyes, although they are not considered compound if they are large. It is thought that their eyes can observe objects in complex time and space, and scientists from

various countries are engaged in studying this subject. It is difficult to understand the tripartite wave-particle-field nature of all things because particles, energy, and waves exist in complex time and space, and the human eye cannot see the phases of waves.

That the human eye "cannot see phases" is not a simple problem, although solutions are expected to be found in the future and the science of the human body will likely overcome this limitation. Human beings live in an ocean of electromagnetic waves, similar to athletes swimming through water (medium). By realizing, experiencing, and understanding, we rely on our profound practical experience of life to sense the world's entirety and prove the presence of the invisible world. Realization does not come through normal extrinsic sensory organs, but rather by the exploration of the potential and function of human life, making the invisible "visible". The immeasurable becomes able to be sensed, thus producing a complete and closely-linked universe. Such concepts differentiate traditional Eastern science from modern Western empirical science. Human beings are not balanced with some additional value; rather, humans have an intrinsic value. There is a general connection between everything in the universe on a number of spatial levels; therefore, any change in the universe will produce images concerning a range of complex energy/complex time-space. These images contain information on a specific range of the universe and this concept is similar to the Yin and Yang theory of traditional Chinese medical science. Human organs (e.g., hands, feet, and ears) contain information regarding the entire body and may be connected with the whole body through certain channels (either visible or invisible). Thus, one part can be extrapolated to the entire body and yield information about the entire body.

The field theory of physical Yi theory integrates modern Western scientific field theories with the principle of the four images of Li Yin and Yang. It can thus serve as a new scientific system that incorporates the best aspects of traditional Yin and Yang five-element theory and Yi theory while including natural principles and laws. This theory can effectively connect

the core elements of the existing theories of electromagnetism, relativity, quantum mechanics, and Newtonian mechanics with consistent logic. In combination with the energy of surface time-space matter, fundamental particles on various microscopic levels serve as the foundation and destination of this theory.

8.6 The interaction of light and matter fields

Everything is inseparable from light. Sunlight provides the necessities for life in general, e.g., photosynthesis in plants. Similarly, the food sources of human beings essentially originate from light-matter with light characteristics. Unlike geometrical optics, physical optics accounts for the linear transmission rules of light and considers the interaction between light and matter fields and the occurrence of energy exchange.

8.6.1 The theory of allelopathy

In optics, for different wavelengths, the refractive indices $n(1/\lambda)$ of a given medium are also different. As such, the different colors of light are separated out in a phenomenon known as light dispersion. According to the Liyi theory of adaptability between types of matter with various characteristics of Yin and Yang and motion and rest, it is simple to derive the law of the refraction of light. The propagation velocity of light in a general medium is u (which is less than c, the propagation velocity of light in a vacuum) and the ratio of v over u is:

$$N = v/u \qquad (8\text{-}9')$$

where v is the velocity of the light particle (Yang) or the moving body and u is the velocity of the medium's matter (Yin). Generally, compatibility between types of matter with different characteristics of Yin and Yang and motion and rest (different indices of refraction) can be divided into three regimes:

(1) The velocities are in harmony, $n = v/u' \approx 1$, e.g., light travels in a vacuum.

(2) The speed of light is higher than that of the carrier medium, $n = v/u > 1$. For example, when light travels from an optically sparse medium to an optically dense medium, the propagation speed of refracted light (u) slows down. Discussed below, n is a refractive index that is well known in the field of optics. It should be noted that the propagation speed slows down, not the velocity of the refracted light; velocity is an intrinsic physical property of the refracted light and is generally less prone to change (except under certain special conditions).

(3) The moving matter is restrained, $n = v/u < 1$; the energy of a moving body is lower than that of the carrier medium. Thus, the moving body is inhibited and suppressed so it cannot pass through the medium. For example, a phonon can be transmitted in the air, but not in a vacuum. Light can be transmitted in a vacuum, but not in a black hole for the same reason. A black hole is a region of high-energy matter space.

Empirical science does not have any concept equivalent to "Yin and Yang, motion and rest". As such, it is difficult for empirical science to explain why the propagation speed of light in a homogeneous medium slows down. However, according to the Liyi theory of adaptability between Yin and Yang objects and motion and rest, the derivation of the law of the refraction of light is simple. The interaction of light and matter fields leads to the slowing down of the refracted light's propagation. The refraction, reflection, and diffraction of light are all, in essence, the same phenomenon.

8.6.2 The refraction of light

As described above, when light travels from an optically sparse medium (e.g., air) to an optically dense medium, it refracts at the interface and the speed of the refracted light (i.e., the propagation speed, u) lessens. In general, the space/time ratio of a magnetic dielectric medium is lower

than that of the speed of light, c. Let the speed of the incident light be v and refracted light be u. As such, the adaptability mentioned above (i.e., the index of refraction) can be expressed as follows:

$$n = v/u \rightarrow u = v/n \quad (8\text{-}10)$$

where u represents the speed of the refracted light; v represents the speed

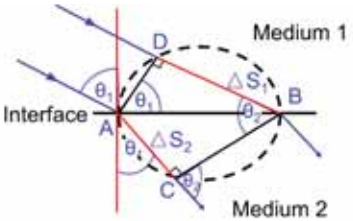


Fig. 8-1. Law of the refraction of light

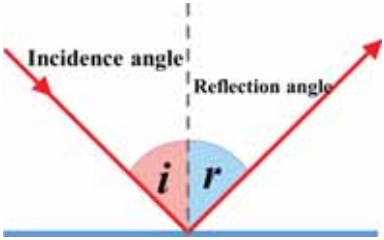


Fig. 8-2. Law of the reflection of light

of the incident light; and n is the index of refraction or adaptability. As shown in Fig. 8-1, when two beams of parallel light propagate from a uniform medium (1) into a uniform medium (2) at angle θ_1 with a standard side length AB, refraction occurs at the refraction angle of θ_2. At the same time, Δt, when the two light beams reach points B and C, the paths through which they have passed are not the same; the difference can be calculated as follows:

$$\Delta S_1 = AB \sin\theta_1 = u_1 \Delta t, \quad \Delta S_2 = AB \sin\theta_2 = u_2 \Delta t \quad (8\text{-}11)$$

The comparison of the two formulas yields: $\Delta S_1/\Delta S_2 = \sin\theta_1/\sin\theta_2 = u_1/u_2$. According to equation (8-13), $u_1 = v/n_1$ and $u_2 = v/n_2$; these expressions can be introduced into equation (8-11) to derive the formula for refraction as follows:

$$n_1 \sin\theta_1 = n_2 \sin\theta_2 \ \ i.e. \sin\theta_2 = (n_2/n_1)\sin\theta_1 \quad (8\text{-}12)$$

This is the expression of the law of the refraction of light. If the light propagates from an optically thinner medium into an optically denser

medium, then $n_1/n_2 < 1$; therefore, $\theta_2 < \theta_1$ (with respect to the line normal to the boundary) and $u_1/u_2 = n_2/n_1 > 1$, which implies that $u_2 < u_1$. As such, the path of the light is also reversible because when the light propagates from the optically thinner medium into the optically denser medium, it is refracted and the speed of propagation of the refracted light is reduced. Meanwhile, when the light propagates from the optically denser medium into the optically thinner medium, it is also refracted and the speed of propagation of the refracted light increases. The propagation speed of the refracted light, rather than its velocity, increases or decreases and its velocity is an intrinsic physical quantity.

8.6.3 The reflection of light

The law of the reflection of light is a special case of light refraction. When light propagates into a uniform medium of the same type as that from which it originates, only its direction changes. According to equation (8-17), if $n_2 = n_1$, then $\sin\theta_2 = \sin\theta_1$ and $\theta_2 = \theta_1$, as shown in Fig. 8-3; if $\theta_1 = 90°$, and there is no reflected light.

The principle of a reversible light paths reveals that when light propagates from an optically thinner medium into an optically denser medium, the light's propagation speed is reduced. In contrast, when light propagates from an optically denser medium into an optically thinner medium, the propagation speed of the light increases. This principle is also illustrated by the shortening or lengthening of the path through which the light passes in unit time. The propagation speed of light in a medium is u, which is smaller in free space, $u \le c$; the ratio between c and u is the refraction index, $n = c/u \ge 1$. Therefore, the following relationship arises:

$$\Delta S = u\Delta t = (c/n)\Delta t \rightarrow \Delta S \Delta c \Delta t \qquad (8\text{-}13)$$

This relationship is important, although two points must be clarified. (1) Refracted light and incident light are not the same. Refracted light is emitted through the interaction of incident light and the interface of the

media. (2) The concepts of the speed and velocity of light must be differentiated. Velocity refers to the speed required for the motion of a moving object (light) during propagation and any decrease or increase in speed is constrained by the principle of promotion and restraint, as reflected in the phenomenon of vehicles with the same horsepower driving at different speeds on different road surfaces. Velocity (or frequency) is an intrinsic physical quantity of matter, which is determined by its mass-energy-time-space characteristics and is not easily changed under normal conditions, especially for light particles. In summary, according to the theory of adaptability between Yin and Yang and between moving objects and resting objects in Liyi theory, it is simple to derive the law of refraction. With regard to relativistic particles and low-speed particles, a similar argument can be made by replacing c with v, producing identical results.

8.6.4 The diffraction of light

Waves emitted by the same wave source generate the phenomenon of interference on a viewing screen due to their different propagation paths. When this description is adopted, the phase difference between the waves that arrive at a given spot via different paths is related only to their effective optical paths. Thus, the brightness at a given spot on the screen has a certain value and a stable overall pattern is formed. However, suppose a description of non-interfering incident light is adopted. In that case, the phase differences of the waves propagating to a given spot on the screen change quickly and erratically. In such conditions, it is impossible to form a stable interference phase length or a mutually canceling interference pattern on the viewing screen; instead, the behavior will constantly change between the two situations, making it impossible to observe the light and dark stripes.

The human eye is composed of materials on the molecular level and can only resolve the visible light emitted by an object that is also composed of material on the molecular level. The energy of visible light is

approximately ~eV (electron volts). The energies and frequencies of X-rays are nearly three thousand times higher than those of visible light. Radiation with high energy, high penetration capability, and high resolution, gives better visibility; this enables people to use the spatial and temporal scales of X-rays to measure distances between atoms and their spatial distributions in crystals, visible light being ineffective in this situation.

The most commonly used X-ray polycrystalline diffraction technique (XRD) exhibits the well-known Bragg diffraction law for the determination of crystal structures:

$$2d \sin\theta = n\lambda \qquad (8\text{-}14)$$

where λ is the known X-ray wavelength and d is the lattice spacing of the crystal (to be determined). The crystal lattice spacing of a TiN sample (also called chord particles or virtual particles) exists on three scales, d_{200}, d_{111}, and d_{220}. Values calculated for these parameters based on the characteristics of the four images of mass, energy, space, and time are shown in Table 8-5.

Table 8-5. A TiN sample lattice (string particles) scales and characteristics based on the four images of mass, energy, space, and time.

Quaternity	D-Space $\boldsymbol{\lambda_d = d[m]}$	T-Time $\boldsymbol{v = c/d[s^{-1}]}$	E -Energy $\boldsymbol{T = 1/\nu[s]}$	E -Energy $\boldsymbol{E = \frac{h}{T} = h\nu\,[J]}$	m -Mass $\boldsymbol{m = Ec^{-2}[kg]}$
d_{200}	2.1207×10^{-10}	1.4136×10^{18}	7.0740×10^{-19}	5.8468×10^{3}(eV)	1.04224×10^{-32}
d_{111}	2.4491×10^{-10}	1.2241×10^{18}	8.1694×10^{-19}	5.0628×10^{3}(eV)	9.0249×10^{-33}

d_{220}	1.4996×10^{-10}	1.9991×10^{18}	5.0022×10^{-19}	10.1993×10^{3}(eV)	1.3247×10^{-31}
$CuK\alpha_1$	1.54056×10^{-10}	1.9460×10^{18}	5.1387×10^{-19}	8.0489×10^{3}(eV)	1.4348×10^{-32}

Constants: $c = 2.9979 \times 10^{8} m \cdot s^{-1}$; $h = 6.6262 \times 10^{-34} J \cdot s = 4.1360 \times 10^{-15} eV \cdot s$;
$1J = 6.2419 \times 10^{18} eV$

In comparison to the characteristics of the four images of mass, energy, space, and time for X-rays ($CuK\alpha_1$ radiation) and blue light (B) of equivalent level, no differences are observed (see Table 2-2).

8.7 The speed of light is not the highest possible speed

The theory of special relativity defines the speed of light as the highest possible speed. Almost all modern textbooks claim that the speed of light is the maximum possible speed in the universe and is a constant. In fact, this is not the case. Light is a form of electromagnetic matter and originates from the structure of matter. Light has the characteristics of the four images of mass, energy, space, and time. From the perspective of mathematical relationships, these four elements embodying the nature of light are independent and correlated; their independence lies in the fact that they cannot hold with any missing element. Their correlation lies in the fact that when one element changes, the others change accordingly. Everything in the objective world, whether as small as a particle or as grandiose as the universe, is always in motion and changing. The essence of Yi is change. Things are in constant motion and continually changing and light is no exception. The principle of the constancy of the speed of light, as proposed by Einstein, is only a theory of secular science. The light emitted from matter in surface space has the same speed, but may have different frequencies or wavelengths, i.e., different energies ($E = hv$); the higher the

frequency, the greater the energy. Therefore, the constancy or variability of the speed of light is conditional.

8.7.1 The momentum of the photon

$$\Delta p/\Delta t = \Delta(mc)/\Delta t = m\Delta c/\Delta t + c\Delta m/\Delta t = f_c + f_c^{'} \geq 0, \text{ if}$$

$$f_c^{'} = c\Delta m/\Delta t \approx 0$$

$$\text{while } f_c = m\Delta c/\Delta t = ma_c \geq 0 \rightarrow a_c = \Delta c/\Delta t \geq 0, \text{ i.e., } \Delta c \geq 0 \quad (8\text{-}15)$$

As such, light particles can be accelerated when light passes through a microscopic space-time field of high-energy. Similarly, when light passes through a microscopic space-time field of low energy, the light's propagation speed will slow down and the light will be blocked and inhibited, which is a common phenomenon.

In Liyi theory, physical quantities with determined maxima, such as c, h, and π, are treated as parameters (rather than constants), as well as gravitational acceleration, g. All these are related to the structure of matter and its distribution and forms of existence in the space and time of the universe. Gravity waves do exist in the universe. Differences in their spatial and temporal factors of generation and propagation lead to changes in their propagation velocity.

8.7.2 Constancy of light speed: "red shift" and "blue shift"

Light interacts with matter fields, resulting in energy exchange. Although the speed of the light remains the same, the frequency or wavelength of the light changes and thus the phenomena of "red shift" or "blue shift" can occur. These phenomena can be validated as follows.

Although the speed of light remains constant, the frequency or wavelength of the light changes. The solution can be found by integrating

to $=0$, when $\Delta t > 0$, $1/\Delta t$ can be separated to obtain a partial differential equation. $1/\Delta t$ can be directly derived from the following binary function:

$$\Delta c = \Delta(\lambda v) = \lambda \Delta v + v \Delta \lambda = 0;\ \ \Delta c = \Delta(\lambda v) = \lambda \Delta v + v \Delta \lambda = 0$$
$$\therefore \lambda \Delta v = -v \Delta \lambda \rightarrow \Delta v / v = -\Delta \lambda / \lambda \qquad (8\text{-}16)$$

When $\Delta\lambda > 0$, then $\Delta v < 0$, i.e., the frequency of the light decreases. Because the energy of light is proportional to the frequency of light, the energy of the light also decreases.

The law expressing that the speed of light is constant is as follows: when light propagates in a low-energy space-time field (e.g., the earth), the speed of light can be regarded as a constant and its frequency may decrease (or its wavelength may become higher, $\Delta\lambda > 0$). This phenomenon of an increase in wavelength is called a red shift. In contrast, when light passes through a high-energy space-time field, if the speed of the light remains constant, then its frequency may become higher (or its wavelength shorter, $\Delta\lambda < 0$). This phenomenon of a decrease in wavelength is called a blue shift. These two phenomena show that the interaction of light with a field of matter causes conditional energy exchange. The prerequisite for the constant speed of light is that the scale of the macroscopic time-space field must be greater than that of the microscopic time-space field corresponding to the light particles. This macroscopic space is a low-energy space-time field corresponding to the superficial material world and generally does not alter the speed of light.

8.8 Four images of Yin and Yang and five elements

Ancient Chinese physics holds that the five elements—metal, wood, water, fire, and soil—constitute all matter in our universe and, indeed, this claim is correct. Moreover, the five elements also have orientational characteristics, namely, the pattern of a circle with a square inside (or the sacred circle and the earthly square) formed of the five elements, in which

metal, wood, fire, and water lie on the four cardinal directions with soil at the center. This emphasizes that soil is both central and a symbol of virtue, embodying the idea that greater value is found in the center. Among the concepts of *ren*, *yi*, *li*, *zhi*, and *xin*, *xin* (credibility) is prioritized. When interpreted using the Li graph theory of the four images of Yin and Yang and the five elements, the four images of mass, energy, time, and space lie in the four cardinal directions, while Li is found in the center. This centered Li is also an image of the five elements and the central subject, possessing the material and spiritual characteristics (the wave-particle-field trinity) of one entity (see Field Theory II).

Table 8-7. Li graph theory of Yin and Yang's four images and the five elements.

No. 1 (the first principle of energy) the principle/law of the four images of mass, energy, space, and time	Materiality/characteristics of oneness
No. 2 the principle/law of action and the balance of interaction potential and force	(particle - field)
No. 3 the principle/law of conservation of momentum in the YN field	(particle - field)
No. 4 the principle/equilibrium law of YXi complex energy conservation	(particle-wave motion - field)
No. 5 the principle/law of the matter-field resonance kinetic effect	Matter-field resonance dynamic effect

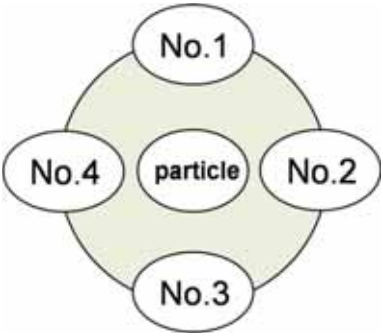


Fig. 8-3. Li diagram of the four images of Yin and Yang and the five elements

Moreover, in terms of the "wave-particle-field trinity", we also have four basic dynamics principles/laws, which form a Li diagram of the four images of Yin and Yang and the five elements (Fig. 7-5). The four images lie in the four cardinal directions with Li at the center. Furthermore, as described in Fig. 8-3, the Li theory of the four images of Yin and Yang and the five elements indicates that the principle or law of the matter-wave resonance kinetic effect is key. No. 5 of the five elements suggests the idea that being in the center is more valuable, containing even higher meaning.

The multi-dimensional space-time theory of the four images of Li Yin and Yang and the four elements and Liyi theory form the core of modern particle physics and Yi unified field theory. The laws of the universe are connected, as are the implications of the laws of physics. The matter-field resonance dynamic effect manifests in the overlaying of amplitudes (vector) and intensities, or the square of the amplitude (scalar); the former is embodied in complex space-time. The former is Yin, while the latter is Yang, with one Yin and one Yang representing the dual kinetic effect. In terms of the unity of particles/waves • particles • fields • spin, the particles are the waves and whenever there are waves, we find spin. Spin and rotation embody (complex) energy, which is in direct proportion to the frequency, or the reciprocal of time. The shorter the temporal period, the shorter the wavelength of the particle. Positive effect and positive energy are

symmetrical, harmonious, and ordered. Resonance is an energy field effect, also commonly known as “assimilation” or “syntony”. In Yi theory, the essence of the resonance effect is the “harmony of Yin and Yang”, allelopathy, and vibration. The harmony of Yin and Yang begets all things, exhibiting an additive effect in terms of positive energy.

Any spectroscopic phenomenon in physics is inextricably related to this concept because the energy of a wave’s movement is proportional to the square of its amplitude. As such, the intensity of a composite wave is also the square of its amplitude. The positive energy effect applies in general; various phenomena in other spaces produce powerful fields and their energy is embedded in different frequency spaces or field spaces. To obtain these positive energies, humans must communicate with these other spaces; when the psychological space of humans resonates or assimilates with these frequency spaces, energy can be harvested from them. Regarding the level of the ideological realm, such a realm is also a manifestation of psychological space; the higher the level of the ideological realm, the higher the energies in the corresponding frequency space and field space. The human mind is extremely important. If humans have benevolent minds, the energy of benevolence in the universe will join with and support them; if they have evil minds, evil will come to hurt them. Therefore, when acting, one must uphold a correct state of mind to ensure that the energies one emits are all positive. In doing so, one will be repaid with positive energy.

Resonance effects are very common and very powerful. The resonance between particles forms the basis of all communicated information. In other words, this is the only form in which life manifests in this material world. All particles of different sizes and structures have different ranges of vibration and resonance frequencies. The transmission of all known forms of energy is realized through the resonance of these particles of different sizes; therefore, the most effective means for transmission of energy field effects is through resonance. Resonance is also known as sympathetic vibration. The greater the similarity between resonating objects, the more

significant the resonance effect.

From the perspective of the electromagnetic spectrum, the energies of the movements of matter in the microscopic world, such as atomic nuclei, electrons, and photons, are transmitted in the form of wave motion. Humans and other organisms are also objects consisting of matter in the universe and, therefore, they certainly possess universal resonance. In addition to fixed frequencies of breathing, heartbeat, blood circulation, etc., the waves generated by the human brain while thinking also produce resonance phenomena. This resonance effect is a form of field dynamics. The findings of the "water crystallization experiment" conducted by the Japanese scientist Dr. Masaru Emoto can lead humanity back to the notion that "matter and spirit are one". However, many people may think that these concepts are nothing but unscientific ancient superstition. There is a phenomenon in modern particle physics called quantum entanglement, which is essentially a resonant kinetic effect between high-energy matter fields. This resonant dynamics effect of matter-wave fields may occur at any time. The emergence of such a dramatic resonance effect also involves even higher laws.

The electromagnetism referred to in Liyi theory should be interpreted broadly, not merely in terms of electromagnetic waves traveling at the speed of light. In electricity, the 115H resonance phenomenon of an oscillating circuit is also called resonance. An essential condition for this resonance is that it must be flexible. When an object is affected by an alien frequency, its frequency must be identical or substantially similar to this foreign frequency. On the whole, the majority of matter in the universe is flexible, be it planets or atoms; they all vibrate at one or more 117H fixed frequencies. The concept of resonance is not only frequently applied in 118H physics; rather, it can also be said that the 119H resonance phenomenon is one of the most common and frequent of 120H natural phenomena. Therefore, it can even be said that resonance creates the universe and everything in the world; without resonance, there is no world.

CHAPTER 9

MAXWELL'S EQUATIONS OF MAGNETIC ROTARY POWER

Abstract: Liyi (LY) theory complies with Maxwell's equations (from Western "Tai Chi"). Through the four principles/laws of LY, we combine the Yi Theory of Tai Chi Yin and Yang, complex Western theory, and the concept of the electromagnetic wave function. We can integrate Maxwell's equations to reveal the particle/wave-particle-field-spin unity and rotation mechanism, interpret the YM electromagnetic equilibrium law and propagation law of electromagnetic waves, and deduce the principle of electromagnetic wave-rotational mechanics.

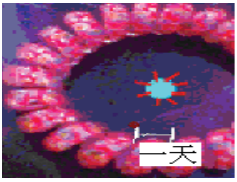
Three Stories Illustrated Using Figures

(1) The rotation and revolution of the earth around the sun forms a periodic curve in time and space (Fig. 9-1a), and the motion track of one day (T) per cycle (D) (Fig. 9-1b) is the dividing line between Yin and Yang fishes in the Tai Chi diagram called the "middle curve" (Fig. 9-1c). It is also a periodic curve of the rotational cycle or a rotational sinusoidal wave (Fig. 9-1d) and Fig. 9-1d is also the "rotational periodic curve S (sinusoidal wave)", which is revealed using Maxwell's equations (Fig. 9-1e).

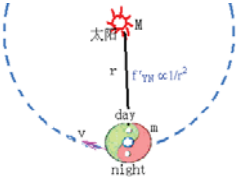
(2) The period of circular rotation refers to the time an object requires to return to the initial position after one circular rotation; the expansion of

"circular rotation" exhibits the periodic curve of longitudinal rotation S (sinusoidal wave).

(3) LY theory selects the binary system as the system to be observed, which satisfies Yin and Yang's dialectic laws and motion and rest. Specifically, the earth (which is moving and is denoted as m) and the potential field of the sun (which is static and denoted as M), as with an electron in the central potential field of an atom, constitute the binary system: $\langle m\rangle \in \langle M|m\rangle,\ m \ll M$. In this manner, we can simplify the binary system as a unitary one (moving particles) for our purposes. This simplifying approach is conditional. There is also a certain difficulty in transitioning from the specialized case to the generalized case (the necessary conceptual change causes this difficulty).



(a)



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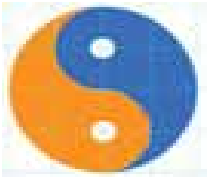
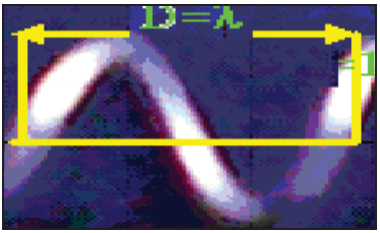


(c)



(d)

$$\nabla \cdot E = 0,\ \nabla \cdot H = 0.$$

$$\nabla \times E = -\partial B/\partial t,\ \nabla \times H = \partial D/\partial t.$$

$$E = (1/\varepsilon)D,\ H = (1/\mu)B.$$

(e)

Fig. 9-1. (a) Schematic: space and time periodic curve along which the earth moves around the sun; (b) orbit of the rotation of earth (1 day/cycle) around the sun; (c) the "middle curve" in the Tai Chi diagram; (d) a rotational periodic curve S (sinusoidal wave) with $D = \lambda$ and $T = 1/v$; (e) Maxwell's equations reveal the mechanism of circular sinusoidal waves

9.1 Maxwell's electromagnetic equations and analytical preview

More than 150 years ago, the British mathematical physicist James Clerk Maxwell left an immortal scientific monument to humanity in the form of his magnetic (H) and electric (E) equations, which are simple, symmetrical, harmonious, and ordered. Maxwell's equations combine the beauty of Yi theory, physics, and mathematics in one, with many implications. This set of algebraic (3×2)-matrix equations has three features:

(i) Yin and Yang are symmetrical, harmonious, and ordered and constitute a system by themselves.

(ii) The equations are partial differential algebraic equations of vectors.

(iii) The equations include eight variable symbols (including *E* and *H*) and four rotational ∇ symbols. These features also provide some ideas to solve significant problems: first, the number of unknown variables is greater than the number of equations, and other relevant algebraic equations must be used for the solution; these other equations cover the four principles/laws of LY. Second, rotation refers to a cycle, period of rotation, and the mechanism of rotational motion. These features imply that the interpretation of LY is different from any of the existing approaches found in the scientific world.

Table 9-1. Maxwell's electromagnetic equations and analytical preview.

	Maxwell magnetic (H)-electric (E) algebra equations		**Analytical preview**
I	$\nabla E = 0$	$\nabla H = 0$	Electromagnetic waves spirally propagate YM magnetic-electric equilibrium law Magnetic-electric state equation
II	$\nabla E = -\partial B/\partial t$	$\nabla H = \partial D/\partial t$	
III	$E = (1/\mathcal{E})D$	$H = (1/\mu)B$	
The password to be solved: ∇, $\partial/\partial t$; B, D; $1/\varepsilon$, $1/\mu$, E, H			LY four principles/laws

The Chinese are concerned with opportunity, favorable geography, and popular support. Maxwell's equations can be viewed like a complex lock that must be solved with a set of keys; these keys are the four images and five elements of Li Yin and Yang theory. The lock and keys are a perfect match. Maxwell's electromagnetic algebraic equations and the LY principle/law can be combined to solve the law of electromagnetic wave particles' cyclic rotational motion. The results prove that:

(1) A general electromagnetic wave is a transverse wave; the electromagnetic amplitudes are perpendicular to each other and perpendicular to the direction of propagation of particle waves.

(2) The particles of electromagnetic waves propagate spirally; this motion is called the rotational cycle or rotational S (i.e., sinusoidal wave) periodic cycle.

(3) The derivation of the YM magnetic-electric equilibrium law reveals that the electromagnetic rotational S "sinusoidal wave" is consistent with the "middle curve" of the Tai Chi Yin-Yang fish; they are both in a complex form that includes rotation, achieving the unity of three in one holographic electromagnetic wave function.

Fig. 9-2. A perfect combination

The puzzle has been solved on the abstract level. As for the unity of particles, waves, fields, and the spin-period, particles are waves, and if there are waves there is rotation. Rotation is the manifestation of (complex) energy, with the frequency increasing if the energy is greater. The frequency is the reciprocal of time. The shorter the time period, the shorter the wavelength of the particles; i.e., smaller particles have greater (complex) energy (as the reciprocal of time) and greater (complex) momentum (which is the reciprocal of space). In addition to the object to be studied, we must study the relationships between the objects. Every new theory must be first tested to determine whether it complies with other energy conservation principles.

9.2 The principle of electromagnetic wave-rotational dynamics

9.2.1 The principle of energy conservation

Table 9-2. **Theorem 1**: Multiple forms of expression for energy.

1	$E = \mathrm{m}v^2 = pv$ Momentum: $p = mv$	(intrinsic) velocity: $v = D/T = \lambda v$; ($0 \le v \le c$, c is not the greatest possible velocity) $D = \lambda$ $T = 1/v$(λ - wavelength, v - frequency; T - time period, D - space period)
2	□□□□kinetic energy□□□ $E_k = 1/2mv^2 = p^2/2m$	
3	(Total) energy: $E = \mathrm{m}v^2 = E_k + V(r)$	E- intrinsic energy, $V(r)$ - interaction potential;
4	Feature energy: $E(t,r) = E_k + V(r)$	(t,r) The time-space variables of the particle carrier/ environmental time-space variables.
5	$v \propto 1/r, V(r) \propto 1/r$ $\Delta v \propto \Delta V(r) \ge 0$ $\Delta m \propto \Delta V(r) \ge 0$	
6	Binary (m, M) system: $\langle m \rangle \in \langle M \vert m \rangle$ $m \ll M$	
7	Multi-variant / dimensional time-space	particles (T， D), Carrier (t, r) , environmental time-space (t, r) tolerance, harmony

8	Relativistic metric: $v = D/T = \Delta r/\Delta t$: v- space / time ratio, $v \propto 1/r$

These relations, exhibited in the form of differential inequalities or equations, deal with the most fundamental laws and principles of energy conservation in the universe, which must be observed by everything, living or non-living. These laws have deep connotations, cover a wide range of phenomena, and have no counterparts in empirical science. According to the Yi physical field theory, things have holographic relationships—parts reflecting the whole while concentrating information. An important aspect of Yi is that it can be expressed using logical concepts and language. Still, Yi has another side that cannot be expressed adequately in modern empirical science, i.e., changes in Yin and Yang. The movement and stasis of all things show patterns, periodicity, and hierarchy. Different hierarchical levels follow different standards and the higher the level the higher the rate, and thus the higher the energy (including potential energy). In terms of the unity of particle/wave • particle • field • spin periodicity, particles are waves, and where there are waves, there is spin. Spin embodies (complex) energy and higher energy means higher frequency. Frequency is the reciprocal of time—a shorter time means a shorter wavelength of the particle. In other words, smaller particles have higher (complex) energy and (complex) momentum (i.e., the reciprocal of space). In addition to studying things themselves, the relationships between things should also be considered. Time and space are both embodiments of energy at various levels.

Table 9-3. **Theorem 2**: Energy conservation.

◎	Law of "no loss, no gain"	$\Delta m \leq 0, \Delta E_k \geq 0$	"bottleneck", absolute.
◎	Cosmic energy conservation law I	$\Delta V(r) = \Delta E_k$	The law of "no loss or gain" of energy;
◎	Cosmic energy conservation law II	$\Delta E(t,r) = \Delta E_k + \Delta V(r); \Delta E_k \geq 0$	energy · moral · practice
	How to interpret	Enhancing positive energies $[\Delta E(t,r) \geq 0]$ and inhibiting negative energies $[\Delta E(t,r) < 0]$.	
☒	The constancy of energy in time and space/energy conservation law III	$\Delta_{tr} = E(t,r) = 0$ $\Delta V(r)/\Delta r = -\Delta E_k/\Delta t; \Delta E_k \geq 0;$	The constancy of energy in time and space / Maxwell's law of magnetic equilibrium

9.2.2 Characteristics of de Broglie particles

The principle of four images in LY theory reveals that, regardless of the size of particles (i.e., for all matter), they have the four-image nature of mass-energy-time-space, which is one facet of the property of matter; the wave-particle-field-spin property/spirit also exists. The wave property is also a manifestation of the periodic motion state of particles, while the field property is the status that is exhibited by the matter property. Macroscopic

particles with periodic motion also have wave properties. (General) de Broglie particles have the features of waves, particles, fields, and spin, which are mathematically expressed in the following four aspects.

Table 9-4. **Theorem 3**: Characteristics of de Broglie particles-wave-particle-field-spin.

1	Wave-particle duality	$E = \hbar\omega$ $p = \hbar k$ $k = 2\pi/\lambda$ $\omega = 2\pi\nu$	$\hbar' \geq \hbar$ $\hbar = \mathbf{h/2\pi}$ $\mathbf{0} \leq v \leq c$
2	Wave-particle time-space transformation law	$D = \lambda$ $T = 1/\nu$ $v = D/T = \lambda\nu$	
3	Wave equation	$\Psi = \Psi(t, r) = \Psi_0 e^{j\delta}$	
4	Phase angle function δ(t, r)	$\delta = 2\pi(r/D - t/T)$ $= 2\pi(r/\lambda - vt)$ $= (pr - Et)/\hbar$ $= kr - \omega t$	(Four types of representation)

Theorem 4: Noether's theorem says that "if the law of motion is invariant under a certain transformation—namely, it has a certain symmetry—in correspondence, there must be an equilibrium law and a conserved quantity". LY theory refers to this law as Noether's law of equilibrium. In previous sections, we determined that that the Schrödinger wave equation $(E\Psi = \hat{H}\Psi)$ is an equilibrium law. Similarly, in this paper, we also determine that Maxwell's equations (II) present one pair of equilibrium laws, corresponding to the other two conservation principles/laws of LY. The first principle is the YN equilibrium force/uniform circular motion law. The other is the combination of time-space invariance in energy (Theorem III) and the magnetic equation of

Maxwell's equations (II) deduced from the principle of energy conservation/Theorem III. The correlation is determined according to the invariance of time and space; the solution follows.

9.2.3 Dialectics of the eight categories

The dialectics of the eight categories of Liyi theory constitute the schematic classification of all things. The four categories with eight components are Yin and Yang, movement and statics, aggregation and dispersion, and rigidity and flexibility, with one from each pair corresponding to Yin and Yang and each pair following a Yin and Yang schema. When Yang hides, Yin appears; when matter aggregates, energy disperses; when magnetism aggregates, electricity disperses; and when Yang is rigid, Yin is flexible. In the four images of Liyi dynamics, energy (E) and momentum (p) are a Yin and Yang pair; time $(1/T)$ and space $(1/D)$ are another pair of Yin and Yang. Energy and momentum are often inseparable, appearing in a variety of laws with varying weights. Magnetism and electricity are a pair of Yin and Yang.

Yin and Yang and movement and stasis are dialectical, depending on the frame of reference. For example, in relation to the earth and the sun, the sun is static (thus Yang) while the earth is moving (thus Yin); similarly, for electrons and nuclei, the electrons move (thus Yin) while the nuclei are static (thus Yang). Another interpretation holds that Yin and Yang, or movement and stasis, depend on the observation system, in which movement and stasis are relative. In other words, movement is relative to stasis and stasis is relative and not absolute. All things in the universe are moving and changing regularly. The *Dafa* of the universe is always the standard for no movement and no change.

9.3 Derivation of the YM magnetic-electric equilibrium law

9.3.1 The YM magnetic-electric equilibrium law

The Maxwell equations (II) that need to be solved, $\nabla \times E = -\partial B/\partial t$ and $\nabla \times H = \partial D/\partial t$, constitute a pair of partial differential equilibrium equations with electromagnetic vectors that are both independent and correlated; the left sides of the two equilibrium equations are the rates of change in relation to space, while the right sides are related to time. In the following section, we first solve the electric equilibrium equation; the solutions are derived from the integration of the two Maxwell equations (II) and the Liyi field momentum conservation theorems.

Table 9-5. Derivation of the YM electric equilibrium law.

◎	Maxwell II/electric force equation	$\nabla \times E = -\partial B/\partial t$ ($f_e = -f_e{}'$)	$\partial B/\partial t$=vΔm/Δt= Δp/Δt$\vert_v$,
1	Law of field momentum conservation / circular motion Two forces with different properties	$\Delta p/\Delta t = \Delta(mv)/\Delta t = m\Delta v/\Delta t + v\Delta m/\Delta t = f + f' = 0 \rightarrow f = -f'$ $f = m\Delta v/\Delta t = \Delta p/\Delta t\Delta_m$($v$ is changeable); $f' = v\Delta m/\Delta t = \Delta p/\Delta t\Delta_v$ (m is changeable)	
2	Deduction of equilibrium force	1) $f = m\Delta v/\Delta t = mv^2/r$, $(\Delta v > 0)$; (f-commonly known as Newton force) 2) $f' = v\Delta m/\Delta t = f'(1/r^2)$, $(\Delta m > 0)$;$f'(1/r^2)$ - Gravitational field;	

$f = -f'$: $\mathrm{m}v^2/r = -f'\,(1/r^2)$, and $f_e = f_e'$: $\nabla \times E =$

3 $-\partial B/\partial t$, are compared on two sides:

$f_e = -f_e'\ \Delta m v^2/r$ and $f_e' = f' \rightarrow \partial B/\partial t = f'\,(1/r^2)$

◎ YM electric-equilibrium law $\therefore f_e = -f_e'\ \Delta m v^2/r = -f'\,(1/r^2)$

◎ Variable of Maxwell's equations (f_e'):

$$\partial B/\partial t = v\Delta m/\Delta t = \Delta p/\Delta t\Delta_v, \quad \rightarrow \partial B = \Delta p\Delta_v$$

(1) *Derivation of the YM Electric Equilibrium Law*

Closed circle: The principle/law of momentum/field momentum conservation is combined with the electrical equation of Maxwell's equations (II). The method of elimination by analogy is applied to give a solution for the YM electric-equilibrium law.

(2) *Derivation of the YM Magnetic Equilibrium Law*

String circle, energy conservation, and interactive potential-force equilibrium laws are combined to solve Maxwell's (II) magnetic-equilibrium law analogically.

Two unknown parameters ($\partial \mathrm{B}/\partial \mathrm{t}, \partial \mathrm{D}/\partial \mathrm{t}$) of the 150 year-old Maxwell equations are solved here—the two pairs of conservation principles/equilibrium laws and their solutions have clear physical implications; furthermore, they play a key role in solving another pair of unknowns $(1/\varepsilon, 1/\mu)$ in Maxwell's equations (III). The electric equilibrium law and the magnetic equilibrium law are both interdependent and correlated; in combination, they give rise to the YM magnetic-electric equilibrium law.

Table 9-6. Derivation of the YM magnetic equilibrium law.

◎	Maxwell II/magnetic force equation	$\nabla \times H = \partial D/\partial t\ (f_m = -f_m^{'})$	
1	(Theory-2 ◎ Time-space invariance of energy/Theorem III of energy conservation	$\Delta V(r)/\Delta r = -\Delta E_k/\Delta t$	
2	Interactive potential-force equilibrium law	$\Delta V(r)/\Delta r = -f'\ (1/r^2)$	$f'\ (1/r^2)$ indicates the direction.
◎	YM electric equilibrium law	$\therefore \Delta V(r)/\Delta r = -\Delta E_k/\Delta t$	
◎	Variable of Maxwell's magnetic force equilibrium law/equation	$\partial D/\partial t = -\Delta E_k/\Delta t$	$\rightarrow \partial D = -\Delta E_k$

9.3.2 Diagram of the YM Magnetic-Electric Equilibrium Law

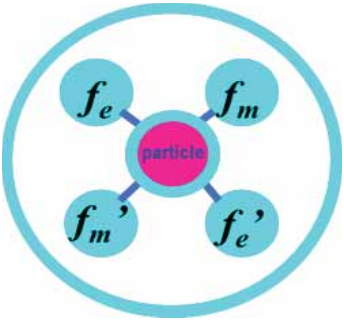


Fig. 9-3. Square and circle diagram of the YM magnetic-electric equilibrium law

Theorem 5: Combination of the law of causality and the YM magnetic-electric equilibrium law.

9.3.3 The vector expression form of the YM magnetic-electric equilibrium

Table 9-7. Diagram of the YM magnetic-electric equilibrium law.

1	**"No loss, no gain" law**	**$\Delta m \leq 0$, $\Delta E_k \geq 0$;**	**"Bottleneck", absolute**
2	Law of energy conservation in the universe	$\Delta V(r) = \Delta E_k$;	Energy conservation principle
3	Electromagnetic differential equilibrium law	$\Delta(mv^2) = \Delta V(r)$;	(Unity of time-space and perfect differentiation)
4	(1)YM electromagnetic equilibrium law $\nabla \times \mathrm{E} = -\partial \mathrm{B}/\partial \mathrm{t}$ ($f_e = -f_e{}'$)	Four forces/energies $f_e = m\Delta v/\Delta t = mv^2/r$ $f_e{}' = v\Delta m/\Delta t = f\,'\,(1/r^2)$	
	(2)YM magnetic-equilibrium law $\nabla \times H = \partial D/\partial t$ ($f_m = -f_m{}'$)	$f_m = \Delta H/\Delta r = \Delta V(r)/\Delta r$ $f_m{}' = \partial D/\partial t = -\Delta E_k/\Delta t$	

The essence of force is energy. Energy also has direction and is affected by potential fields, including vertical and horizontal fields. A magnetic field has rotational symmetry through its core; electricity surrounds the core to generate horizontal circulation in a concentric-circular manner. The magnetic-electric longitude-latitude coordinates extend from the inside to the outside to form a maximum cohesive force and the small

size of the matter implies stronger magnetism. The matter system in magnetic element theory has a strengthened core, a solid longitude line, a dominant latitude line, and a consistent core and hub. The movement also has spin.

Theorem 1: Dynamic factors of electromagnetic spin: on the one hand, a pair of balanced forces act on a moving body or matter (m), i.e., centrifugal force, f (E-force), and centripetal force, f' (H-force). They both lie along the same line and are identical in strength, but they go in the opposite directions to maintain the same track radius. In contrast, a moving body carrying an electric charge, $f_e = mv^2/r$ (E-energy), moves with a circular motion, with the direction of movement (v) being perpendicular to the balanced magnetic-electric force and longitudinal magnetic energy, $f_m' = \Delta E_k/\Delta t$ (H- energy) (Fig. 9-4).

Theorem 2: The latitude line of the electrical energy surrounds the

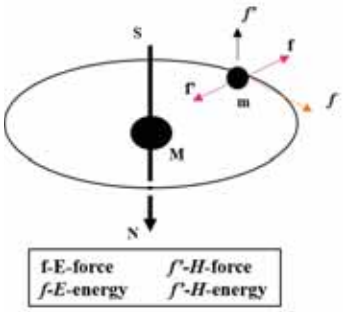


Fig. 9-4. Balance of electric and magnetic forces, where electric energy is perpendicular to magnetic energy

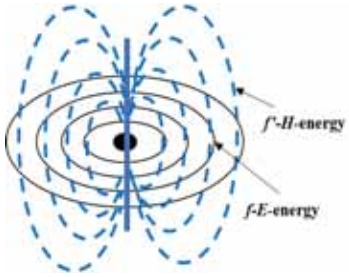


Fig. 9-5. The longitudinal line (crossing the center) and the latitudinal line (surrounding the center) are mutually perpendicular

center along the tangent (v vector) direction of the circle; the longitude line of the magnetic energy crosses the center in a semi-circular manner. Closer to the center, the electric-magnetic density and energy are higher. The

longitudinal and latitudinal electromagnetic distributions of the spherical potential field follow the radial direction. The longitudinal magnetic energy crosses the center to form the longitude line semicircular loop (Fig. 9-4).

Theorem 3: Only two forces are exerted upon an object rotating around an axis at high speed: one centripetal and one centrifugal. The centripetal and centrifugal forces are equal in magnitude and opposite in direction; they act on the same object and cause the object to have a uniform circular motion. These two forces are horizontal and transversal, while the force in the longitudinal direction results from the ordered energy of the overall potential field and its stepped distribution. This phenomenon also depends on the composition and structure of the object, e.g., both atoms (Class I) and the earth (Class II) have centered potential fields. Ranging from the macro to the micro, globular structures are abundant in the universe. They take the most beautiful form because spherical structures possess the most robust structural factors.

9.3.4 The structure of matter in magnetic element theory

The structure of matter in magnetic element theory is centered on magnetism. The mass and electromagnetic wave are unified and the nature of mass is magnetism. The center of the system strengthens with tight longitudinal lines and strong latitudinal lines, while the center and hub remain consistent. The lines of longitude and latitude extend from the inside to the outside to ensure maximum cohesion. If the center of the system weakens such that the longitudinal line is not tight and the latitudinal line is weak, we see degradation. Like a snowball, it will not become larger as it rolls if the center is not tight and it will break easily. For the central potential field of an atom, energy is distributed in spherical shells from inside to outside and high to low levels. The electric force (centrifugal force) and magnetic force (centripetal force) in equilibrium are applied simultaneously to moving particles. The energy flow of particles rotates periodically around

the center along a given circular orbit and will not enter into other orbits. The circle around the core is described as the latitudinal line and closed-circle potential spin. The closer to the center, the smaller the radius and the greater the potential energy, velocity, and realized energy. The atom exhibits a spherical mass-electric-magnetic structure with a center. This structure has the greatest symmetry and stability, and its energy converges without closure. All the planets known to human beings are round without exception and almost all orbits describe perfect circles. The trajectories of the planets are round or nearly round. The galaxy, which is constituted of countless stars, is also round. The circle represents perfection, roundness, balance, and harmony and is the optimum state in the universe.

9.4 Significance of the YM magnetic-electric equilibrium law

9.4.1 The four major forces unified

The four fundamental forces can be divided into two pairs. One pair concerns electric (or energetic) equilibrium: (a) the force of moving bodies ($f_e = mv^2/r$), commonly known as the Newton force due to the repulsive force required by the object's movement; and (b) the universal interaction force [$f_e^{'} = f(1/r^2)$], which is inversely proportional to the square of the distance (replacing "universal gravity"). The other pair concerns the magnetic force (energy) equilibrium: (a) the radial rate of change of the interaction potential [$f_m = \Delta V(r)/\Delta r$], a type of attractive force, or the magnetic driving force; and (b) the time rate of change of kinetic energy [$f_m^{'} = \Delta V(r)/\Delta r$], a type of magnetic force, showing that the moving body must be acted upon.

This theory shows four fundamental interaction forces in nature, unifying the four major forces and four energy types. The essence of force is energy and force manifests energy and interaction between matter. There are Yin and Yang relationships in which similar or different types of matter repel or attract according to their properties. These interactions of repulsion and attraction combine to achieve equilibrium, which can be called energy equilibrium in a broad sense, i.e., the equilibrium of interaction forces. The higher the interaction forces, the more stable the system. The "law of universal gravity" should be renamed as the "law of universal interaction forces" because it is impossible for a system to have only gravity, but no repulsive force to ensure stable existence.

9.4.2 Unification of the YM magnetic-electric equilibrium law

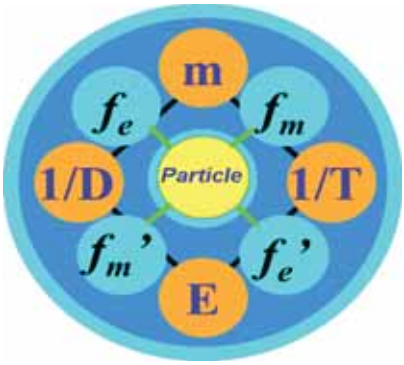


Fig. 9-6. The 8 trigrams of particle physics science

The unification of the four images of mass-energy-time-space and the five elements, also known as the "five-element diagram of the heavenly circle and earthly square" (or a circle on the outside and a square centered within) with the square-circle diagram of the YM magnetic-electric equilibrium law, gives rise to the eight trigrams of particle physics science (Fig. 9-6). The four major forces in pairs of Yin and Yang assume the four cardinal directions. At the same time, the four images of mass-energy-time-

space are located at key positions, with the particle (with characteristics of wave and particle fields) in the center, embodying the idea of placing a more valuable object in the center. Two pairs of equilibrium forces located at the four corners of the diagram yield the unification of the five elements with the following three characteristics:

(1) a pair of electric equilibrium forces—the driving force for the moving body, ($f_e = mv^2/r$), is in balance with the universal interaction force, $[f_e^{'} = f(1/r^2)]$;

(2) a pair of magnetic equilibrium forces—the radial change rate of the interaction potential, $[f_m = \Delta V(r)/\Delta r]$, one type of attraction force, i.e., the magnetic driving force balances the change rate of kinetic energy, $(f_m^{'} = \Delta E_k/\Delta \mathrm{t})$;

(3) electromagnetic forces are a pair of Yin and Yang and equilibrium in Yin and Yang mean equilibrium in the electromagnetic forces, $f_e = f_m$. Furthermore, it is worth noting that the so-called electromagnetic forces in Liyi should be viewed in a broad sense and do not only refer to the light particle electromagnetic force, but also include gravity at the molecular level and the electromagnetic forces of microscopic particles, among others. The holographic characteristics of particles can be expressed using the generalized electromagnetic wave function.

As shown in Fig. 9-6, the eight trigrams of particle physics science exhibit a central structure with a circle on the outside and a square within. There happen to be eight equations and "particle/characteristics" assume the center position. Coincidentally, in another set of pairs, another 8 trigrams are presented in the next chapter.

9.4.3 Convergence, self-consistency, and causality

Usually, the number three is the most important. The Li Yin Yang theory of four images and five elements, Chinese traditional Tai Chi Yin and Yang, and Maxwell's equations of spin dynamics perfectly match each other throughout the universe and space-time. They are convergent and self-consistent, implying causality.

(1) Inequality/equality—"no loss, no gain" is a fundamental law of the universe. The equation/equilibrium is conditional.

(2) Equations—the principle of conservation and the law of equilibrium can be established and are valid.

Table 9-8. Five laws.

1	"No loss, no gain" law	$\Delta \boldsymbol{m} \leq \boldsymbol{0}, \Delta \boldsymbol{E_k} \geq \boldsymbol{0}$;	"Bottleneck", absolute.
2	The energy conservation law of the universe	$\Delta V(r) = \Delta E_k$	Energy conservation principle/law
3	Law of magnetic-electric differential equilibrium	$\Delta(mv^2) = \Delta V(r)$;	(time-space unity and perfect differentiation)
4	Electric-equilibrium law	①$\boldsymbol{\nabla \times E = -v\Delta m/\Delta t = \Delta p/\Delta t|_v}$	Mass energy is converted to electromagnetic energy, and electricity and magnetism respond to each other.
5	Magnetic-equilibrium law	②$\nabla \times H = -\Delta E_k/\Delta t$	

(3) Inequality—everything consumes energy, subject to the constraints of the laws of causality and entropy.

Table 9-9. Two solutions.

Solution 1:	$\Delta \boldsymbol{E}/\Delta \boldsymbol{r} = -\boldsymbol{v}\Delta \boldsymbol{m}/\Delta \boldsymbol{t}\Delta \mathbf{E} = -\mathbf{v}\Delta \mathbf{m}(\Delta \mathbf{r}/\Delta \mathbf{t}) = -\boldsymbol{v}^{\boldsymbol{2}}\Delta \boldsymbol{m} \geq \mathbf{0}$; $(\Delta \boldsymbol{m} \leq \mathbf{0})$
Solution 2:	$\Delta H/\Delta r = -\Delta E_k/\Delta t,\ \Delta H = -v\Delta E_k \leq 0\ \ (\Delta E_k \geq 0)$

(4) In the future, the law of allelopathy will change.

Somatic human science will come into existence in the future. When standards of human morality are increased to a certain extent, the conscious enhancement of positive energy and the suppression of negative energy will become a social and moral goal because it meets humanity's expectations. A vast population in the world is currently practicing this technique and has shown it to be feasible.

Table 9-10. Cosmic energy conservation law.

$\Delta E(t,r) = \Delta E_k + \Delta V(r)$; $\Delta E_k \geq 0$.	Energy moral practicing	Cosmic energy conservation law II
Interpretation: How to enhance positive energy $(\Delta E(t,r) \geq 0)$ and inhibit negative energy $(\Delta E(t,r) < 0)$		

9.5 The mechanism of the earth's rotation and revolution around the sun

The laws at the macro and micro scales are consistent. The earth's rotation and revolution around the sun is identical to the path that electrons take around a nucleus while spinning.

9.5.1 Wave characteristics of the earth particle

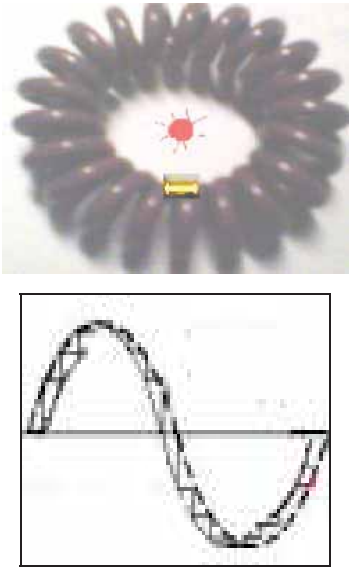


Fig. 9-7. Schematic diagram of the time-space curve of the revolution of the earth particle around the sun

The characteristics of the earth may be referred to in relation to the H atom wave equation of quantum mechanics. The basic parameters of the earth's rotation wave function are as follows: (1) the earth has the movement velocity $v = D/T$, (T, D), the time-space period of the earth's rotation; (2) the earth is a particle in the centered potential field of the sun, (t, r): $v(t, r) = \Delta r/\Delta t$; $v = D/T$. On the side of the earth turned to the sun, it is day, while the opposite side experiences night. The earth completes a day by accomplishing a spin; one Tai Chi period = a spin circle or spin S curve. One spin circle period is a Tai Chi period (Fig. 9-7); (3) the revolution of the earth particle around the sun has a space-time curve (left); the earth's rotation in one circle (one day) has another (sinusoidal shaped) time-space curve (right).

9.5.2 The mechanism of the earth's rotation around the sun

The Earth is a centered spherical mass-electric-magnetic rotator, having both a particle and a wave nature; the spin exists because where there is a wave, there is spin. The space-time curve of the earth's rotation assumes the spinning circular shape of the "middle curve" in the fish-like figure of the Tai Chi and Yin and Yang (as will be explained later). The dynamic spin pattern of the periodicity of the Tai Chi spin circle is similar to that of an electron's rotation around a nucleus and the rotation of nine planets around the sun. Each planet has its orbit, as does each galaxy, controlled by the laws of the universe. As the earth rotates, it always faces the sun with its Yang side, while its Yin side faces in the opposite direction, . This law of the Tai Chi rotation of Yin and Yang applies in human society as well, making it appear as an incessantly repeating periodic cycle and understood as the law of cyclical change. Because time and space are binary, the earth rotates through a cycle; time and space also run in cycles called spin cycle periods. This concept is very important because it applies to all rotating bodies. The earth is a hollow mass-electric-magnetic rotating body, with "center + electromagnetic axis" duel symmetry. The earth uses an electromagnetic axis as its major axis and the gravity axis as its minor axis. However, empirical science does not consider things in this way.

9.6 The circle is the most beautiful shape

Ancient Greek philosophers believed that, "among all the plane figures, the circle is the most beautiful, and among the stereographs, the sphere is the most beautiful shape". The Tai Chi diagram has inherited this most beautiful configuration and breakthroughs and innovations have been accomplished by linking it to traditional Chinese philosophy and cosmology. All known planets are round without exception and are almost always perfectly circular. The trajectories of the planets are also round or nearly

round. The morphology of galaxies, consisting of numerous planets, are also round. The microscopic particles that constitute matter in the world, such as atoms and electrons, are round as well, and so on. The circle describes a perfect cycle, which is unbroken and uninterrupted.

The earth is a spherical, centered, flexible inside and rigid outside, mass-electric-magnetic rotating body. Different space-time systems have different structures of matter. The earth is an electromagnetic conductor at the molecular level and the directions of the earth's rotation and revolution are the same. According to the right-hand coil rule of electromagnetism, the coil's center is the large axial magnetic field crossing the earth's north and south poles. Spinning in close cycles, the earth is spherical and centered; closer to the geo-center, the radius is lower, and velocity, energy, and potential are higher. The lines of longitude are oriented in a north-south direction and all of them are semicircular. Two opposite longitudinal lines form a longitudinal line loop and any longitudinal line loop can divide the earth into two hemispheres. Across the globe, along the east-west direction, the cycles surrounding the earth are called lines of latitude. All of these latitude lines are parallel to each other and perpendicular to the longitude lines. The latitude lines are oriented in an east-west direction. These longitudinal and latitudinal lines are not restricted to the earth's surface, but ubiquitous. The intensity of the electromagnetic field is highest along the axis and at the geo-center. Longitude and latitude are similar to human meridians; the more microscopic they are, the more powerful their energy. Furthermore, they are more stable and less evil compared to visible matter, and are also denser and thus more real.

9.7 Holographic electromagnetic wave function

LY field theory integrates the idea of four images and five elements in Li Yin and Yang, the Yin-Yang diagram of Tai Chi, and Maxwell's electromagnetic equations and presents the holographic electromagnetic

wave equations. It is summarized in Table 9-11.

LY theory applies the Yin and Yang concept of Yi theory and the idea of unification of Yi theory, physics, and mathematics, combined with Maxwell's algebraic equations on the basis of the conservation principle/equilibrium law. Through logical, rational dialectics, LY theory deduces the YM magnetic-electric equilibrium law, reveals the law of particle/wave-particle-field-spin movement, and illustrates the principle of electromagnetic wave-rotational dynamics. We have applied the mathematical model of the Chinese Tai Chi diagram to study quantum mechanics and relativity. Thus, the Western and Eastern philosophies of human beings are finally synchronized in a new form of long-term thinking and exploration of nature. Traditional Chinese culture advocates for the "unity of heaven and humanity". Only by complying with this spirit and preserving nature, can human beings achieve natural harmony.

Table 9-11. The holographic electromagnetic wave function.

1	Tai Chi Yin and Yang-wave function	$\Psi(t,\ r) = \Psi_0 e^{i\delta}$ (wave function of quantum mechanics)
2	Electric-magnetic complex vector wave function	$\Psi(\mathrm{E},\ \mathrm{H}) = (E_0 e^{i\delta},\ H_0 e^{i\delta})$
3	Tai Chi Yin and Yang fish-wave function	$\Phi(cos\,\delta,\ sin\,\delta) = R + iJ;\ R = (E_0 + H_0)\,cos\,\delta,$ $J = (E_0 + H_0)\,sin\,\delta$
	$(t,\ r)$ - Bearing medium/environmental time and space, $e^{i\delta}$ - Euler equation, $i\delta$ -phase angle equation	
4	Holographic electromagnetic wave function - $\Psi = \Psi(t,\ r) = (\Psi_0)(e)^{i\delta}$ (every physical quantity has a profound physical meaning)	

CHAPTER 10

WAVE-SPIRAL PROPAGATION AND MASS-ENERGY

Abstract: In this chapter, we continue to solve Maxwell's equations of spin dynamics, including: 1) deriving the general law of spin circular cyclic propagation of electromagnetic waves; 2) adopting the S-T vector pair of magnetic theory to derive the universal mass-energy relationship (including Einstein's mass-energy relationship); 3) generating the four-image five-element diagram of magnetism, electricity, time, and space. Eventually, we constitute the "eight-diagram" picture of physical Yi theory and the equations of field theory.

10.1 The principle of energy conservation

Table 10-1. **Theorem 1**: Maxwell's algebraic equations of magnetic (H) and electrical (E) fields.

I	$\nabla \cdot E = 0$	$\nabla \cdot H = 0$
II	$\nabla \cdot E = -\partial B/\partial t$	$\nabla \cdot H = \partial D/\partial t$
III	$E = (1/\varepsilon)D$	$H = (1/\mu)B$
To be solved: $\nabla, \partial/\partial t; B, D;\ 1/\varepsilon,\ 1/\mu, E,\ H$		

In the previous chapters, we have proven the complex vector form of electromagnetic waves as follows:

$$\chi = \chi(E,\ H),\ E(t,\ r) = E_0 e^{j\delta};\ H(t,\ r) = H_0 e^{j\delta}.$$

It is beneficial to remember these equations for the following derivation. A proper scientific system does not only need systematic theoretical principles, but also logical thinking and rigorous research methods to reach harmony and order. Together with the interpretation of Maxwell's magnetic-electric equations and comparison with the traditional Eastern Tai Chi diagram, the combination of achievements by modern Western mathematics and physics can reveal the time and space concept in a ten-sided world. The great law of the universe must guide the unification of the four major interactive forces.

The core of Maxwell's equations is the differential equations of the electric force equilibrium (*E*) and the differential equations of the magnetic force equilibrium (*H*). What we need to interpret is the relationship and meaning of the symbols ∇ and $\partial/\partial t$ of the spin dynamics in the equation. According to Noether's theorem, two different functions rely on invariant transformation in time and space. On the right side we find a symbol indicating differentiation with respect to time, while ∇ on the left side represents differentiation with respect to space. Let us first begin with the simplest of Maxwell's equations for electromagnetic fields (($\nabla \cdot E = 0, \nabla \cdot H = 0$)) and develop a solution for the symbol of spatial differentiation, ∇.

First of all, ∇ is the mathematical differential symbol with respect to space. In mathematics, if the dot product of two vectors is equal to 0, such as $A \cdot H = 0$, the two vectors, *A* and *C*, are perpendicular to each other. This is the same if we replace *A* with the differential symbol ∇, i.e., $\nabla \cdot C = \partial C/\partial r = \Delta C/\Delta r = 0$. Analogously, we can derive the symbol for spatial differentiation: $\nabla = \partial/\ \partial$r, where *r* is a vector. On this basis, we can solve Maxwell's electric field equation:

$$\nabla \cdot E = (\partial/\partial r) \cdot E = (\Delta/\Delta r)\, E = 0\ \therefore \Delta E/\Delta r = 0 \quad (10\text{-}1)$$

where E is Maxwell's electric field vector. We can solve Maxwell's

magnetic field equation as follows:

$$\nabla \cdot H = (\partial/\partial r) \cdot H = (\Delta/\Delta r)\, H = 0 \ \therefore \Delta H/\Delta r = 0 \quad (10\text{-}2)$$

This relation indicates that *E* and *H* are two vectors perpendicular to a specific direction. It should be noted that the three forms of the differentiation symbol are equivalent:

$$\nabla = \partial/\partial r = \Delta/\Delta r \quad (10\text{-}3)$$

where 1) ∇ is the symbol of spatial differentiation for the spin dynamics that are often used in the theory of electromagnetic field; 2) $\partial/\partial \mathrm{r}$ is the symbol for partial spatial differentiation, which is often used in quantum mechanics; and 3) $\Delta/\Delta r$ is the differentiation symbol often used in the field of Yi theory. These differentiation symbols can use in mathematical operations similar to physical quantities and can be found in normal textbooks. For example, if the ∇ operator acts on a wave function of $C = \Psi_0 exp\,[j(pr - Et)/\hbar'\,]$, and $\nabla \cdot C = 0$, we have:

$$\nabla \cdot C = \nabla \Psi_0 exp\,[j(pr - Et)/\hbar'\,] = (jp/\hbar'\,)C = 0 \rightarrow$$
$$Cp = 0,\ C \perp p. \quad (10\text{-}4)$$

This example indicates that the wave function in complex time-space is a special vector function; the direction of its rate of spatial change is perpendicular to *p*. We will see later that *E* and *H* exhibit this property in Maxwell's electromagnetic theory and the direction of propagation is closely related to the vector of momentum, *p*. We can determine the temporal rate of change operator based on the relationship of field momentum conservation: $\partial/\partial t = \Delta/\Delta t$. The operator of the temporal rate of change is scalar, that is, Δt is often used as a scalar and appears in the denominator of many types of mathematical expressions; the field momentum conservation is evolved into the relationship of equilibrium force:

$$\Delta(mv)/\Delta t = m\Delta v/\Delta t + v\Delta m/\Delta t = \Delta p/\Delta t|m + \Delta p/\Delta t|v$$
$$= f + f' = 0 \quad (10\text{-}5)$$

where $f = \frac{m\Delta v}{\Delta t}, f' = v\Delta m/\Delta t = \Delta p/\Delta t|v$ represent the partial

differentiation of p (namely v) with respect to t for constant m and the partial differentiation of p (namely m) with respect to t for constant v, respectively. Therefore, f and f' are two force vectors with different properties, which means that we can use the form of a simple scalar to reveal the complicated problem of electromagnetic vectors. This solution is unique to the mathematical and physical method of physical Yi field theory. The symbol *f* represents the force (electric force/repulsive force) for the uniform circular motion of a moving object and f' is the driving force (magnetic force/attractive force) for the uniform circular motion of a moving object; at the same time, this parameter indicates the magnitude and direction of forces.

10.2 The wave-spiral propagation law of electromagnetic particles

In Maxwell's equations (I), two equations, $\nabla \cdot E = 0$ and $\nabla \cdot H = 0$, are combined to reveal the wave-spiral propagation law of electromagnetic particles. Liyi has solved the problem for the operator of the temporal rate of change from the relationship of field momentum conservation: $\partial/\partial t = \Delta/\Delta t$.

10.2.1 Proof that *E* and *H* are perpendicular to each other

In mathematics, the dot product of two vectors that are perpendicular to each other is equal to zero, which indicates that the *E* and *H* vectors are perpendicular to the same specific direction, $\Delta/\Delta r$, namely $\nabla = \partial/\partial r = \Delta/\Delta r$; this fact is not sufficient to prove that *E* and *H* are perpendicular to each other. Moreover, $E(t,r) = E_0 e^{j\delta}$ and the two sides of Maxwell's equation (II), $\times E = -\partial B/\partial t$, are expanded. The left side is expanded according to space, $\nabla \times E = jk \times E = jkk^0 \times E$ ①, and the right side is expanded according to time, $-\partial B/\partial t = -\partial[B(r)e^{-j\omega t}]/\partial t = -j\omega B$ ②; the right sides are defined as equal, $kk^0 \times E = \omega B$, and Maxwell's

equation is introduced to obtain:

$$kk^0 \times E = \omega\mu H \tag{10-6}$$

$\therefore H \perp E$, $H \perp k^0$; $E \perp k^0$; (k^0 is wave vector), namely a transverse wave.

10.2.2 The momentum vector of electromagnetic particles: $\boldsymbol{p} = \hbar' \boldsymbol{k}$

Because $E(t,r) = E_0 e^{j\delta}$, we introduce $\delta = (pr - Et)/\hbar' = kr - \omega t$ in two representations:

$$\nabla \times E = (j/\hbar')p \times E \quad ②\nabla \times E = jk \times E = jkk^0 \times E \tag{10-7}$$

$$\therefore p = \hbar' kk^0,\ k = 2\pi/\lambda,\ \omega = 2\pi v \tag{10-8}$$

Theorem 2: Wave velocity, $v = \lambda v = k\omega = D/T$, $0 \le v \le c$; therefore, the wave is generally described as an electromagnetic wave.

In this chapter, from Maxwell's equations I-II-III, we prove for the symbol of partial spatial differentiation, $\nabla = \partial/\partial r$. Besides, Liyi has solved the operator of the temporal rate of change from the relationship of field momentum conservation, $\partial/\partial t = \Delta/\Delta t$. This operator of partial temporal differentiation is scalar, whereas the nominators, p, B, are vectors.

Theorem 3: Electromagnetic waves are transverse waves. The electromagnetic amplitudes are perpendicular to each other and vertical to the direction of the particle's wave propagation. This is the (general) wave-spin propagation law of electromagnetic particles.

10.2.3 Transverse wave property of electromagnetic waves

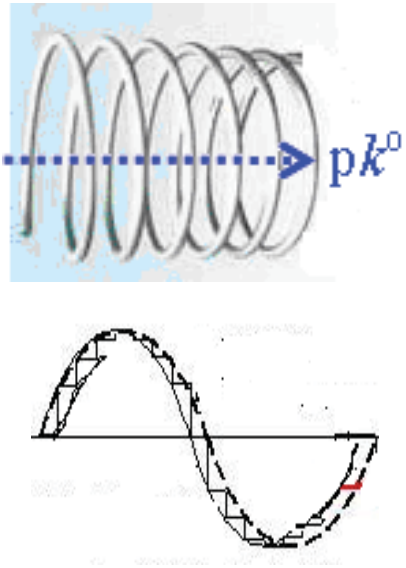


Fig. 10-1. Electromagnetic particles exhibit spiral propagation

Table 10-2. Transverse wave property of electromagnetic waves and law of spiral propagation.

1	Symbol of space spin dynamics	$\nabla = \partial/\partial r = \Delta/\Delta t$
2	An electromagnetic wave is a transverse wave	$H \perp E$, $H \perp k^0$; $E \perp k^0$; k^0 is the wave vector
3	Momentum vector and wave vector are consistent	$p = \hbar' k = \hbar' kk^0$, $k = 2\pi/\lambda$, $\omega = 2\pi\nu$

Fig. 10-1 shows how (light or other particles) electromagnetic waves exhibit spiral propagation, termed the circular spin period or spin S (short

for “sinusoidal wave”) cyclical circulation. Closed circular motion and off-source (radiation) electromagnetic wave propagation are all similar. This type of “sinusoidal wave” and “central curve” in the Tai Chi diagram are the same and both represent particle spin.

10.3 Interpretation of Maxwell’s electromagnetic equations

Based on an analysis of time and space, we can adopt a simple scalar method to process Maxwell’s vector equation of electromagnetic force. The common aspects of the two equations are as follows:

(1) Maxwell’s equation of electric force equilibrium reveals two types of electric forces with different properties: the left side (f_e) is the spatial change rate of *E* and the right side $(f_e^{'})$ is the temporal change rate of *B*; the equation is expressed as follows:

$$\nabla \times E = -\partial B/\partial t \tag{10-9}$$

where $f_e = \nabla \times \mathrm{E}$, and $f_e^{'} = \partial \mathrm{B}/\partial \mathrm{t}$.

(2) Maxwell’s equation of magnetic force equilibrium reveals two types of magnetic forces with different properties: the left side (f_m) is the spatial change rate of *H* and the right side $(f_m^{'})$ is the temporal change rate of *D*. Maxwell’s equation of magnetic force is expressed as follows:

$$\nabla \times H = \partial D/\partial t \tag{10-10}$$

where $f_m = \nabla \times \mathrm{H}$ and $f_m^{'} = \partial D/\partial t$; therefore, $f_m = \nabla \times H = \Delta/\Delta r$.

(3) What is the relationship between E and H? What is the relationship between B and D?

The following question centers on how the mentioned equations can be combined to solve for “B”, H, $\partial B/\partial t$, and $\partial D/\partial t$? In particular,

$\partial B/\partial t$, $\partial D/\partial t$, "B", and D are called the "code (I)" of Maxwell's theory of electromagnetic field and concern many questions in other aspects. Modern empirical physics does not yet have relevant and specific concepts and we will apply the Liyi electromagnetic theory of spin dynamics to solve these problems. We need to connect this with other relationships: first, the relationship of field momentum conservation and Maxwell's equation of electric force are combined; second, the law/principle of energy conservation and Maxwell's equation of magnetic force are combined. There are two types of electromagnetic waves. One type is the wave of electromagnetic oscillators with a source (such as electrons and photons), which is the spin circular electromagnetic wave for uniform circular motion in the central potential field. Another type is an electromagnetic wave far from the oscillating source, i.e., an electromagnetic wave propagating along a straight line. The solution method is similar, but the results have different forms.

10.4 Solution of the spin-circular motion equation

10.4.1 The vector equation of electric force and electric energy

Maxwell's equation of electric force is solved by combining this equation with uniform circular motion and conservation of field momentum in the following form:

$$\nabla \times E = -\partial B/\partial t = m\Delta v/\Delta t\Delta m = -\Delta p/\Delta t\Delta v = mv^2/r \quad (10\text{-}11)$$

In the following, we solve for the electric force and electric energy using the method of analogy:

(a) Electric force: $f_e = \nabla \times E = mv^2/r = m\Delta v/\Delta t = ma \neq 0$; the direction of the electric force is far from the center of symmetry, namely centrifugal force, $a = \Delta v/\Delta t = v^2/r$, where a is the acceleration of uniform circular motion, which changes direction, but not magnitude.

(b) The flow of electric energy is $\propto \mathrm{m}v^2r$ and the orbit is circular; $\rightarrow$ r does not change and the magnitude of v does not change, whereas the direction changes (along the tangential direction of the circle).

(c) The electric force on the right side (on the temporal change rate):

$f_e^{'} = \partial B/\partial t = \Delta p/\Delta t|_v = 0$, where $\partial \mathrm{B} = \Delta \mathrm{p}|_v$, $\Delta t \neq 0$; $\therefore \mathrm{B} \rightarrow \mathrm{p}|_v = mv|_v$, which is an important relationship.

The electric force, f_e, is the force for the motion of a moving object and actually refers to the repulsive force in the uniform circular motion-electromagnetic equilibrium force, i.e., the centrifugal force. The acceleration of electric force is present here; it only changes direction without the changing magnitude. The moving direction of objects is perpendicular to the electric force, f_e, which indicates that it is in line with the tangential direction of the circle. Hence, the electric force, electric energy, and electric energy are three related electric vectors, but with different concepts.

10.4.2 Solution for magnetic force and magnetic energy

Maxwell's equation of magnetic force is solved by combining the law/principle of energy conservation and law/principle of interactive potential energy-force. The equation of magnetic force is combined in the following form:

$$\nabla \times H = \partial D/\partial t = -\Delta E_k/\Delta t = \Delta V(r)/\Delta r = -f^{'}(1/r^2) \quad (10\text{-}12)$$

In the following, we solve the multi-element differential combined equation of magnetic force/magnetic energy (for the operator of partial spatial differentiation):

(a) Magnetic force on the left side (spatial change rate of H),

$$f_m = \nabla \times H/\Delta r = \Delta V(r)/\Delta r \neq 0; \ \therefore \Delta H = \Delta V(r).$$

(b) Magnetic force on the right side (temporal change rate of D),

$$f_m^{'} = \frac{\partial D}{\partial t} = -\frac{\Delta E_k}{\Delta t} \neq 0 \left(\Delta m \leq 0,\ \Delta E_k \geq 0\right) *.$$

Important note: an object that moves along a circular orbit has motional force; therefore, the moving object must have internal energy ($\Delta m \leq 0, \Delta E_k \geq 0$). This is the universal law of *no loss, no gain*. Here, $\Delta m \leq 0$ means "loss", and correspondingly, $\Delta E_k \geq 0$ means that the moving object "consumes" kinetic energy. What do we obtain? The moving object receives the driving force to maintain cyclical motion, i.e., the magnetic force.

10.5 Dynamic relationship of electromagnetic waves

10.5.1 Vector equations for uniform motion along a straight line

The equation of electric force is combined with equation (10-11) and the circular motion term $(mv^2/r = 0)$ is eliminated. The expression can be simplified to:

$$\nabla \times E = -\partial B/\partial t = m\Delta v/\Delta t|_m = -\Delta p/\Delta t|_v = 0 \quad (10\text{-}13)$$

We solve the dynamic relationship of electric force/electric field for the linear motion as follows (the operator of partial spatial differentiation is $\nabla = \partial/\partial r = \Delta/\Delta r$):

(a) Electric force (the spatial change rate), $\nabla \times E = \Delta E/\Delta r = 0$□□$\Delta r \neq 0$

$\therefore\ \Delta E = 0 \rightarrow E = mv^2$.

(b) Right side: magnetic force (the temporal change rate): $\partial B/\partial t = \Delta p/\Delta t|_v = 0,\ \Delta t \neq 0;\ \therefore \partial B = \Delta p|_v$, which indicates that the vector of momentum, p, keeps its magnitude and direction unchanged, and $p = kk^0$; k^0 indicates the unit vector in the direction of propagation along a straight line; however, the mass decreases and kinetic energy is consumed.

(c) Solve for the equation of electric field: $\nabla \cdot E = 0,\ (\Delta/\Delta r) \cdot E = 0$ (the two vectors are perpendicular to each other).

$\therefore \Delta E = 0 \rightarrow E = mv^2,\ \Delta r \neq 0;\ E \perp k^0.$

10.5.2 Dynamic relationship of the magnetic force vector

The equation of magnetic force is combined with equation (10-12) and if we assume circular motion, $f' = (1/r^2) = 0$, to simplify the equation:

$$\nabla \times H = \partial D/\partial t = -\Delta E_k/\Delta t = \Delta V(r)/\Delta r = 0 \quad (10\text{-}14)$$

Solve the combined multi-element differential equation of magnetic force/magnetic field as follows:

(a) (Left side) Spatial change rate: $\nabla \times H = \Delta V(r)/\Delta r = 0;$

$\therefore \Delta H = \Delta V(r) = 0,\ \Delta r \rightarrow \infty.$

(b) (Right side) Temporal change rate: $\partial D/\partial t = -\Delta E_k/\Delta t = 0, \rightarrow \Delta E_k = 0,\ \Delta t \neq 0,$

$\therefore E_k = 1/2mv^2 \neq 0,\ \Delta t \neq 0$ (consume kinetic energy);

(c) Equation of magnetic field: $\nabla \cdot H = 0;\ \Delta H/\Delta r = \Delta V(r)/\Delta r = 0;$

$\therefore$ ①$H = V(r);$ □$\Delta r \rightarrow \infty,$ □②$H \perp k_0$

10.5.3 The transverse wave feature of electromagnetic waves

The following is the (general) transverse wave feature of electromagnetic waves and spiral propagation law: $H \perp E,\ H \perp k_0;\ E \perp k_0;\ k_0$ is a wave vector.

Important note: *the propagation of electromagnetic waves is "off-source" rather than without a source*. For the oscillating center "off-source or far from ($\Delta r \rightarrow \infty$) the wave source", although it is not subject to an electromagnetic force, it moves uniformly along a straight line and also must consume energy ($E_k = 1/2mv^2 \neq 0$). Newton's first law is similar.

10.6 The YM causality relationship of electromagnetic dynamics

Table 10-3. **Theorem 4**: Solution of (vector) equations of spin circular wave dynamics for (sourced) electromagnetic particles.

Magnetic force equation	$\boldsymbol{\nabla \times H = \partial D/\partial t}$	$\boldsymbol{\partial D/\partial t = -\Delta E_k/\Delta t}$	$\boldsymbol{\partial D = -\Delta E_k}$; $\boldsymbol{\Delta t \neq 0}$;
Electric force equation	$\nabla \times E = -\partial B/\partial t$	$\partial B \partial t = \Delta p/\Delta t\|_v$	$\partial B = v\Delta m$; $\Delta t \neq 0$;

Table 10-4. **Theorem 5**: Dynamic relationship of linear propagation for "off-source" electromagnetic particles.

i	$\boldsymbol{\nabla \times H = \Delta V(r)/\Delta r = 0}$; $\boldsymbol{\Delta V(r)/\Delta r = 0}$;	Solution: $\boldsymbol{\Delta r \to \infty}$, $\boldsymbol{\Delta H = \Delta V(r) = 0}$
ii	$\mathbf{\partial D/\partial t = -\Delta E_k/\Delta t}$; $\mathbf{\Delta E_k/\Delta t = 0}$	$\Delta t \neq 0$, $\Delta E_k = 0 \to E_k = 1/2mv^2 \geq 0$ (consumption of kinetic energy)
iii	$\boldsymbol{H \perp k^0}$, $\boldsymbol{E \perp k^0}$, $\boldsymbol{p = kk^0}$; $\boldsymbol{H \perp E}$;	E and H are perpendicular to each other

Note: Since the objects move along a straight line, they must have energy even if there is no action of force; therefore, a moving object must consume internal energy, ($\Delta m \leq 0$、$\Delta E_k \geq 0$). This is the universal law of "no loss, no gain", which is an absolute principle. Here, $\Delta m \leq 0$ means "loss", and correspondingly, $\Delta E_k \geq 0$ means that the moving object "pays" kinetic energy. As such, what is gained? The moving object gains the driving force to maintain cyclical motion, namely the magnetic force.

Table 10-5. Yin and Yang and the law of causality.

Equation of electric force equilibrium :	Left: temporal change rate of electric force/v.	$f_e = \nabla \times E = \mathrm{m}\Delta\mathrm{v}/\Delta\mathrm{t}\|_m = mv^2/r$;	Motional force
	Right: temporal change rate of electric force/m	$f_e^{\not B} = \frac{\partial B}{\partial t} = \frac{\Delta p}{\Delta t\|_v} = v\Delta m\ /\Delta t$	Driving force
Gravitational field	$mv^2/r = -GMm/r^2 = mg,\ g = \Delta v/\Delta t$	YN law of equilibrium force-uniform circular motion.	
Extra-nuclear electron	$m_n v_n^2/r_n = -k_n(Ze)(e_n)/r_n^2$	YN (micro-particles) law of equilibrium force-uniform circular motion	

Theorem 6: Yin-Yang and the law of causality. Everything has Yin and Yang. Maxwell's equation of magnetic force equilibrium and the equation of electric force equilibrium are a pair of Yin and Yang. The former is Yin and the latter is Yang; Yin is implicit, while Yang is explicit. The left and right sides of every equation of equilibrium force are also causal. In the YM mechanism of mass-energy and magnetism-electricity alternation mechanism and causality, the vector equation of electric force, E, is $\nabla \times E = -\partial B/\partial t$ ($f_e = -f_e^{'}$).

Table 10-6. **Theorem 7**: H-vector equations of magnetic force.

Equilibrium equation of magnetic force:	Left-magnetic force > spatial change rate of interactive potential energy: $\boldsymbol{f_m = \nabla \times H} = \Delta \boldsymbol{H}/\Delta \boldsymbol{r} = \Delta \boldsymbol{V}(\boldsymbol{r})/\Delta \boldsymbol{r}$; Right-magnetic force as the driving force → temporal change rate of kinetic energy (E_k): $\boldsymbol{f_m^{'}} = \boldsymbol{\partial D/\partial t} = -\Delta \boldsymbol{E_k}/\Delta \boldsymbol{t}$
Results	Maxwell's equation of magnetic force ($\nabla \times H = \partial D/\partial t$) is actually the Liyi law/principle of energy conservation, $\Delta V(r)/\Delta r = -\Delta E_k/\Delta t$ $(f_m = -f_m^{'})$

The simplified law of electromagnetic wave propagation: an object in a state of constant motion also consumes kinetic energy (or internal energy). This statement improves on Newton's first law.

Table 10-7. **Theorem 8**: Intermediate variable: $\partial B = \Delta p|_v$; $\partial \mathrm{D} = -\Delta E_k$.

Intermediate variable: *B*, *D*	$f_e^{'} = \partial B/\partial t = \Delta p/\Delta t|_v = v\Delta m/\Delta t$	Relationship between momentum and kinetic energy: $\partial B/\partial t = v\Delta m/\Delta t$; $\partial \mathrm{D} = -\Delta E_k$; $\Delta \mathrm{t} \neq 0$
	$f_m^{'} = \partial D/\partial t = -\Delta E_k/\Delta t$	

Theorem 9: The vector of momentum, $p = mv$. The Liyi principle/law of field momentum conservation reveals that the temporal rate of change of momentum concerns two types of forces with different

properties. One type is a repulsive force/electric force. The other type is an attractive/magnetic force; to achieve equilibrium between these two forces, they require the cooperation of different external fields (called consociation in mathematics). Other principles/laws are also similar.

10.7 S-T vector pair and mass-energy relationship

To solve the universal mass-energy relationship, we must introduce a new concept. The Chinese website on latent science contains reports on magnetic theory[1] that indicate that magnetism is central to the matter. Mass-electricity-magnetism is considered a single phenomenon, with magnetism being its highest level. Matter and energy reflect the cohesion and diffusion of the magnetic-electric structure. Mass has cohesion, while energy is diffusion. Therefore, we can deduce the magnetic-electric relationship from the mass-energy relationship.

10.7.1 Introducing the vector pair in magnetic theory S-T

Maxwell's equations (III):

$$E = (1/\varepsilon)D,\ \ H = (1/\mu)B \qquad (10\text{-}15)$$

where D and B are two intermediate variables related to mass and energy and, as previously demonstrated, $\partial \mathrm{B}/\partial \mathrm{t} = \mathrm{v}\Delta \mathrm{m}/\Delta \mathrm{t} = \Delta \mathrm{p}/\Delta \mathrm{t}|_v$, $\partial \mathrm{D}/\partial \mathrm{t} = -\Delta E_k/\Delta t \rightarrow \partial B = \Delta p|_v$, $\partial \mathrm{D} = -\Delta E_k$.

Due to the symmetry of Maxwell's equations, we introduce Chen's S-T vector pair of magnetic theory: $S = H \times E$, $T = B \times D$, and $S = (1/\mu\varepsilon)T$, therefore,

$$H \times E = (1/\mu\varepsilon)(B \times D) \qquad (10\text{-}16)$$

According to the property of mass cohesion and energy diffusion, we obtain the equilibrium equation of mass and energy density as follows:

$$\nabla \cdot (H \times E) = \partial \rho_E/\partial t,\ \ ②\nabla \cdot (B \times D) = \partial \rho_m/\partial t \qquad (10\text{-}17)$$

In equation (10-17), ρ_E is energy density and ρ_m is mass density.

$$\therefore \partial \rho_E/\partial t = (\mu\varepsilon)^{-1}\partial \rho_m/\partial t \qquad (10\text{-}17')$$

Equation (10-17′) reveals that there is a linear relationship between energy density and mass density and $(\mu\varepsilon)^{-1}$ is the conversion coefficient.

10.7.2 Solution for the universal mass-energy relationship

Magnetic theory understands everything from the perspective of matter. Having in mind the previous discussion, the mass-energy relationship can develop into a magnetism-electricity relationship and we can solve for the conversion coefficient $(\mu\varepsilon)^{-1}$.

To solve for the universal mass-energy relationship, we separate the time factor in equation (10-17′) $(1/\Delta t \neq 0)$ and derive the full differentiation equation, $\Delta\rho_m = (\mu\varepsilon)^{-1}\Delta\rho_m$.

We calculate the original function from the derivative as:

$$\rho_E = (\mu\varepsilon)^{-1}\rho_m + c_1 \qquad (10\text{-}18)$$

According to the Liyi four-image (mass-energy-time-space) principle, when $\rho_m = 0$ and $\rho_E = 0$, we have $c_1 = 0$; for the given monochrome magnetoelectric medium,

$$\rho_E = (\mu\varepsilon)^{-1}\rho_m \qquad (10\text{-}19)$$

According to equation (10-19), to solve the mass-energy relationship, we should consider mass and energy to be linked by velocity (i.e., space/time ratio). If the monochrome magnetoelectric medium is uniformly distributed in the unit volume, this equation will evolve into the mass-energy relationship of the linear magnetoelectric medium; the left side is energy, *E*, and the right side is mass, *m*. The conversion coefficient is $v^2 = (\mu\varepsilon)^{-1}$, therefore,

$$E = (\mu\varepsilon)^{-1}m = v^2 m \qquad (10\text{-}20)$$

This is the universal mass-energy relationship. Let us solve for the time factor as:

$$\Delta t = \alpha \mathrm{T} \qquad (10\text{-}21)$$

where α is a random real number, namely $1/\Delta t \propto 1/T$.

Theorem 10: Time and space, such as mass and energy, are dynamic variables. If time and space are microscopic, the corresponding dynamic time and space interval is microscopic and the high-energy factor is more prominent.

10.7.3 The universal mass-energy relationship

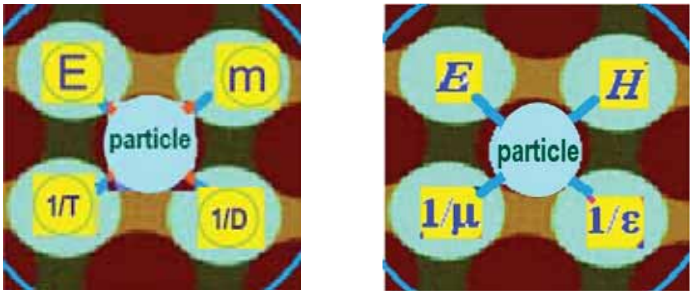
Scientific experiments have proven that the product of two characteristic parameters of the magnetoelectric medium in free space, $(1/\varepsilon_0)$ and $(1/\mu_0)$, is equal to the propagation velocity of electromagnetic waves; electromagnetic wave particles with light speed have common point wave velocity, but different frequencies and wavelengths: $v\ (=1/T)$ and the square of $\lambda\ (=D)$: $c^2=(1/\varepsilon_0\mu_0)$. Here, $(1/\varepsilon_0)$ and $(1/\mu_0)$ are values measured in modern science for ultraviolet light in the free space medium, which indicates that the mass-energy-time-space property of ultraviolet light corresponds to that of a magnetoelectric medium in free space. Therefore, the monochrome magnetoelectric medium has specific first-order and second-order time-space variables. The dimensional validation is $[c^2]=[1/\varepsilon][1/\mu]=[m^2][s^{-2}]$ and the precise value of ε_0 measured by scientific experiments in the medium of free space is $\varepsilon_0=8.854187818\text{（71）}\times10^{-12}C^2\cdot N^{-1}m^{-2}$, $1/\mu_0=\varepsilon_0c^2$.

Table 10-8. **Theorem 11**: Overview of the mass-energy relationship and magnetic-electric relationship in magnetic theory.

1	Universal mass-energy relationship in magnetic theory	$\boldsymbol{E = (\mu\varepsilon)^{-1}m = v^2 m}$; $\boldsymbol{v^2 = 1/\mu\varepsilon}$	($\boldsymbol{h' \geq h}$), ($\boldsymbol{0 \leq v \leq c}$) **1/μ** - magneto-conductivity of (monochrome) magnetoelectric medium; **1/ε** - magneto-conductivity of (monochrome) magnetoelectric medium;
	Velocity and time-space	$\boldsymbol{v^2 = (1/\mu)(1/\varepsilon) = (D/T)^2 = (\lambda v)^2}$	
	Time-space relationship of medium	$\boldsymbol{\Delta t = \alpha T}$; $\boldsymbol{1/\Delta t \propto 1/T}$	
2	Maxwell's equations (III): $E = (1/\varepsilon)D, H = (1/\mu)B$	$v^2 = (1/\mu)(1/\varepsilon)$; $E \propto 1/\varepsilon, D$; $H \propto 1/\mu, B$	
3	Electric/magnetic strength ratio	$\lvert E\rvert^2/\lvert H\rvert^2 = (1/\varepsilon)/(1/\mu) = (D/T)^2$;	
4	Electromagnetic wave strength	$\mathrm{I} = (E+H)^2 = \lvert E\rvert^2 + \lvert H\rvert^2$;	
5	Einstein's mass-energy relationship:	$\mathrm{E} = (\mu\varepsilon)^{-1}m = c^2 m$; $c^2 = 1/\mu\varepsilon$; $\mathrm{c} = (1/\mu\varepsilon)^{-1} = D/T = \lambda v$; $\mathrm{E} = c^2 m = (1/\varepsilon_0\mu_0)m$, $c^2 = (1/\varepsilon_0\mu_0)$	

10.7.4 Generation of Liyi five elements II

Here, we interpret Maxwell's equation (III), which constitutes the four images and five elements II of Li Yin and Yang (magnetic-electric-time-space), as depicted in Fig. 10-2.



(a) (b)

Fig. 10-2. Four-image (magnetism-electricity-time-space) round diagram of Li Yin and Yang

Fig. 10-2a represents a four-image (magnetism-electricity-time) square and a round graph of Li Yin and Yang and its dynamic relationship; magnetism-electricity and time-space are paired as Yin and Yang and are located at four locations in the radial direction, with Li (wave-particle field/strength) at the center. Fig. 10-2b shows the four images of magnetoelectric dynamics, expressed as $H, 1/\mu$, E, and $1/\varepsilon$, and Maxwell's magnetoelectric equations are $E = (1/\varepsilon)D$、$H = (1/\mu)B$.

Everything has Yin and Yang. The previously achieved mass-energy-time-space four-image and five-element Li Yin and Yang (called five-element I) is Yang, and four-image (magnetics, electricity, time, and space) and five-element II of Li Yin and Yang is Yin. These concepts constitute the eight-diagram picture of Li Yin and Yang.

Table 10-9. Generation of Liyi magnetism-electricity-time-space five elements II.

Five elements: four images of magnetism, electricity, time, and space II, as well as their attributes		
Yang	Magnetism (H)	Yin, cohesion, and rigid
	Electricity (E)	Yang, diffusion, and soft
Yin	Time (1/μ)	Yin, cohesion, and rigid
	Space (1/ε)	Yang, diffusion, and soft

10.8 The connection between three-phase properties and time-space

From the macroscale to the microscale, the distribution and variation of everything in the universe with time follows set rules. The first-order time-space (*T* and *D*) variables, energy, and momentum constitute the cyclic phase angle function of electromagnetic waves. In contrast, the second-order time-space variables, $1/\mu$ (time) and $1/\varepsilon$ (space), are related to the amplitude/strength of electromagnetic waves.

10.8.1 First-order and second-order time and space variables

According to the universal mass-energy relationship, $E = (\mu\varepsilon)^{-1}, m = v^2 m$ and $v^2 = 1/(\mu\varepsilon)(1/\mu) = D^2T^2$,

$$\therefore 1/\varepsilon \propto D^2,\ 1/\mu \propto 1/T^2 \qquad (10\text{-}22)$$

Because time (*T*) and space (*D*) are two independent but related physical quantities, we know that 1/μ and 1/ε are a pair of independent second-order time and related space variables. The former (*T* and *D*) are the first-order time and space variables.

As for electromagnetic conductors, $1/\varepsilon$ is conductivity; if $1/\varepsilon$ increases, the conductivity increases. $1/\mu$ is called magneto-conductivity;

if $1/\mu$ increases, magnetic permeability increases. This relationship can be observed from Maxwell's state function of the electromagnetic field $[E = (1/\varepsilon)D$、$H = (1/\mu)B]$, summarized in Table 10-10.

Table 10-10. Magnetoelectric unity and variation of magnetoelectric strength with macro and micro time-space.

Macro-micro time and space	(macro) TD ← time and space in the world → 1/TD (micro)	
The ratio of magnetism and electricity strength	$\|E\|^2/\|H\|^2 = (1/\varepsilon)/(1/\mu);\ v^2 = (1/\varepsilon)(1/\mu)$	
Strength of magnetism	$\|H\|^2 \propto (1/\mu)$、$1/(DT)^2 \rightarrow$ When it is more microscopic, magnetism is stronger and electricity is weaker;	The magnetoelectric unity is always maintained.
Strength of electricity	$\|E\|^2 \propto (1/\varepsilon)$、$(DT)^2 \rightarrow$ When it is more macroscopic, the magnetism is weaker, and the electricity is stronger.	

10.8.2 The mass-electricity-magnetism trinity and the conductive feature

Table 10-11. Comparison between the mass-electricity-magnetism three-phase property and the conductibility of a magnetoelectric medium.

Inductive impedance: $X_L = \omega L$	conducts DC, blocks AC; conducts low frequencies, blocks high frequencies.	○ magneto-conductivity $(1/\mu) \propto 1/\omega L$
Capacitive impedance: $X_c = 1/\omega C$	conducts AC, blocks DC; conducts high frequencies, blocks low frequencies.	○ electric-conductivity $(1/\varepsilon) \propto \omega C$
Resistor: R	blocks AC, also blocks DC; the resistivity depends on velocity.	○ resistivity $(1/\Omega) \propto 1/R$ (resistance), R ∝ m_0, $1/m$; the resistivity of micro high-speed particles is small and vice versa.
According to the mass-velocity-energy relationship of relativity: $m^2(c^2 - v^2) = m_0^2 c^2$ → (i) motional mass $\Delta m \propto \Delta v$; (ii) resting mass $\Delta m_0 \propto -\Delta v$; (iii) ③ $v \to c$, $m_0 = 0$, 则$1/\Omega \to \infty$.		

The magnetic theory of Liyi reveals that everything consists of three phases of mass-electricity-magnetism, with magnetism being both the key and highest level. Any magnetoelectric medium exhibits the mixed properties of resistance, inductance, and capacitance. The difference lies in which property dominates, with the proportion varying. According to electromagnetic theory, the mass-electricity-magnetism three-phase property is linked to the magnetoelectric medium's conductivity, as demonstrated in Table 10-11.

For example, in electromagnetics, an *RLC* series resonant circuit exhibits the important feature that, when the series resonance occurs, the

inductive impedance $(X_L = \omega L)$ is equal to the capacitive impedance $(X_c = 1/\omega C)$; namely, $\omega L - 1/\omega C = 0$, $\rightarrow$ $\omega = 1/(CL)^{1/2}$ or $v = 1/2\pi(CL)^{1/2}$. Here, ω or v is the intrinsic frequency of the circuit; in particular, the light/electromagnetic wave-particle, $v = c$, does not exhibit a resting mass, $m_0 = 0$, so $1/\Omega \rightarrow \infty$.

10.8.3 Second-order time-space and the dispersion phenomenon of light

In optics, the refractivity of a medium varies with its wavelength, $n(\lambda)$. This difference causes the phenomenon whereby when white light is refracted, it is separated out into different colors. This phenomenon is called light dispersion. In the following, we explain the phenomenon of dispersion using the dependence relationship of the magnitude of electromagnetic waves on second-order time-space variables. Let us first examine the conductivity $(1/\varepsilon)$ and magneto-conductivity $(1/\mu)$ of an electromagnetic field. In assessing the strength of electromagnetic waves, magnetism and electricity are not without separation: at a more microscopic level, their magnetic field is stronger, but at a more macroscopic level, their electrical field is stronger. It has been proven that the magnitude of an electromagnetic wave is equal to the squared sum of the amplitude vector, $I = (E + H)^2 = |E|^2 + |H|^2$, and the squared ratio of amplitude, $|E|^2|H|^2 = (1/\varepsilon)/(1/\mu)$.

As such, at a more macroscopic level, the strength of its electrical field is greater:

$$\text{Ie} \backsim |E|^2 \propto (DT)^2 = \lambda^2/v^2 \text{、} (1/\varepsilon); \ \lambda^2 = D^2 \qquad (10\text{-}23)$$

This behavior indicates two things: (i) if it is more macroscopic (such as a low-frequency longwave), *DT* is larger and the electrical effect is greater; (ii) if the second-order space variable, $1/\varepsilon$, is larger, the magnitude of the electric field is more prominent ($1/\varepsilon$ is capacity or conductivity). However, if it is more microscopic, the strength of the magnetic field is greater:

$$Im \backsim |H|^2 \propto 1/(DT)^2 = v^2/\lambda^2、\ (1/\mu);\ v^2 = 1/T^2 \quad (10\text{-}24)$$

Concerning the strength of the magnetic field, we reveal two points: (i) if the electromagnetic particle is more microscopic (such as a high-frequency shortwave), *DT* is smaller. The magnetic effect is more prominent (ii) if the second-order time variable $(1/\mu)$ is larger. The magnitude of the magnetic field is stronger. As for the magnetic body, $1/\mu$ is also called magneto-conductivity.

Newton's prism dispersion phenomenon can be explained as follows: "when white light passes through the prism, it is deflected toward the bottom of the prism; the deflection of purple light is the greatest, and the deflection of red light is the lowest". This behavior indicates that the large deflection of purple light occurs because its frequency is high and its wavelength is short; its magnetic field strength is high (whereas the electrical field strength is weak). Therefore, the distance of the path is long; in contrast, red light has low frequency and long wavelength because the electrical field strength is high (whereas the magnetic field strength is weak); the deflection of red light is the lowest and the path length is short. Therefore, the magnetic field's microscopic effect is prominent, whereas the macroscopic effect of the electric field is prominent.

The magnetic theory of Liyi reveals that when matter is more microscopic, the magnetism of matter is more prominent and the three-phase property (mass-electricity-magnetism) is also confirmed. Why did Newton select a transparent glass body and find that the deflected angle is different for various glass bodies? It is transparent and pure and a rainbow appears after the rain clears. We know that Newton suggested that white light is composed of light with various colors to explain the phenomenon of decomposition of white light passing through a prism. Glass has different refractive indexes for light of different colors. When white light passes through the prism, light of different colors is refracted at different angles, separating it into the color spectrum. When white light passes through a prism, it is deflected toward the prism's bottom; the deflection of purple

light is largest, while the deflection of red light is the smallest. The phenomenon that the prism separates white light into light of various colors is called dispersion. Newton's study on light dispersion can be summarized as follows: light varies in color because the electromagnetic waves have different strengths and the color is the intrinsic property of light; light of the same color belongs to the same frequency. There is no white light, but its appearance can be generated by the appropriate mixing of different wavelengths of light.

10.9 Aggregation of ancient and modern physics: future physics

Future physics will not develop properly solely on a modern Western basis. Current particle physics and Yi united field theory have certain advantages.

First, Liyi theory has an explicit time-space concept, theory, and equations of the four-image property and four-element multi-dimensional space-time concept. This material world composed of everything has the four basic mass-energy-time-space properties and a corresponding Yin and Yang relationship. Mass-energy has an image without form, time-space has a form without an image, and mass-energy and time-space are in pairs as Yin and Yang, constituting everything. Particles are not isolated. In addition to space-time itself (T, D), electromagnetic particles also must have carrier/environmental space-time (t, r). This is the four-element multi-dimensional time-space theory and the Yin and Yang dynamic relationship factors, motion and rest.

Second, four dynamic basic principles/laws/equations of Liyi theory include:

i) algebraic equations on the first principle of energy/relativistic mass-velocity-energy-force;

ii) the LY principle/law/equation of interaction potential energy-force equilibrium;

iii) the YN law of uniform circular motion and the "unification of gravity and electromagnetic force" (including atomic central potential field and wave-spin dynamic theory);

iv) the LY principle of complex energy conservation/YX law/equation of wave dynamics.

These four basic principles/laws of Liyi theory constitute the core of modern particle physics and field theory. For the cyclical unity of particle/wave • particle • field • spin, the particle is a wave and has spin. The spin is a manifestation of (complex) energy and its frequency is higher if the energy is higher. Frequency is the reciprocal of time. If the time-space cycle is shorter, the wavelength of the particles is also shorter; that is, if a particle is more microscopic, its (complex) energy (as the reciprocal of time) is higher, as well as its (complex) momentum (as the reciprocal of space). Besides the object under study, we also must study the interaction between fields of matter; therefore, Liyi has a fifth term called the principle/law of field resonant dynamic effects. For every new theory, we must first verify whether it complies with the principle of energy conservation.

Third, the introduction of the S-T vector pair of magnetic theory creates a bridge between mass-energy and magnetoelectricity and solves the universal mass-energy relationship (which includes Einstein's mass-energy relationship). The three-phase (mass-electricity-magnetism) property of matter is connected with the materiality and conductive properties. Magnetic theory plays an important role in improving Maxwell's theory of electromagnetic fields, which is vital not only for physics, but also for the science of the future.

Fourth, we interpret Maxwell's equations of magnetoelectric spin dynamics. *Maxwell's equation (I)* reveals the law/equation of wave-spin propagation of electromagnetic particles.

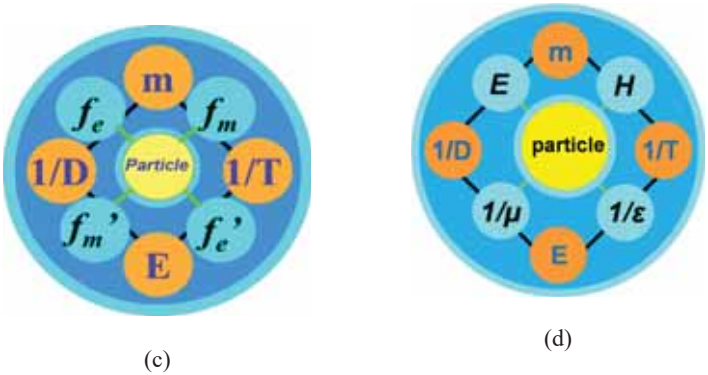
Maxwell's equation (II) reveals the law/equation of electric-magnetic force (energy) equilibrium and unifies the four major forces (/energy).

Maxwell's equation (III) is the principle equation, revealing the conversion relationship between mass-energy and magnetic-electricity, and the connection between magnetic-electricity strength, second-order time-space (or even first-order time-space), and the three-phase property (i.e., mass-electricity-magnetism) of everything. Several principles/laws are combined to reveal the rotation and spiral cycles of particles (everything) in the universe. As such, particle physics will develop towards Tai Chi particle physics.

Fifth, we develop the eight-diagram picture of physical Yi theory. The ancients described everything in the universe in the context of eight diagrams and here we follow the same method. Everything has Yin and Yang. The four images (mass-energy-time-space) and five elements of Li Yin and Yang, developed previously (called the first of five elements), is Yang, and the second of four images (magnetism-electricity-time-space) and five elements of Li Yin and Yang is Yin (Fig. 10-3a, b). These elements constitute the physical eight-diagram picture or physical-mechanical eight-diagram picture of Liyi theory (Fig. 10-3c, d) and can be further developed into the Tai Chi eight-diagram picture (Fig. 10-3e, f). Fig. 10-3 presents the longitudinal and latitudinal constitution of the eight-diagram picture of Liyi physics, including: latitude, with five-element I and four prominent positions around the center, and longitude, with five-element II (b) and the magnetism-electricity-time-space four corner positions passing through the center. The particle/wave-particle-field is at the center, manifesting the idea of the center as the highest. The Li Yin and Yang four-image and five-element diagram is a square and round diagram, called a five-element diagram (centered) with a round outside and a square inside, or a five-element diagram (centered) with a round sky and a square ground.

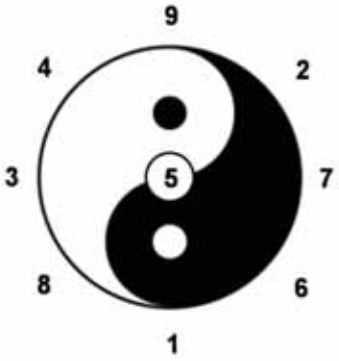
(a) (b)

Fig. 10-3a, b. Five elements I, five elements II

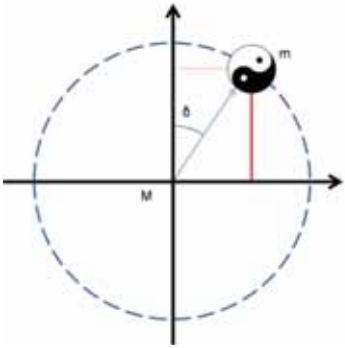


(c) (d)

Fig. 10-3c, d. Two eight-diagram pictures of Yi theory physics



(e)



(f)

Fig. 10-3e, f. Tai Chi diagram, eight-diagram picture, and the systematic binary field

Finally, the equations and diagrams of field theory in particle physics mainly include the following aspects.

Table 10-12. The equations and diagrams of field theory.

1	(Principle) field equation	$\langle m\rangle \in \langle M\|m\rangle,\ m \ll M$ (binary observational system)	Fig. 10-3f
2	Particle, namely Tai Chi	$y = cos\delta + isin\delta$ (Tai Chi has Yin and Yang)	
	(General) electromagnetic wave equation	$\chi = \chi(E_0 e^{j\delta},\ H_0 e^{j\delta})$ (circular spin cycle, transverse)	
3	Tai Chi Yin and Yang wave function	$\Phi = \Phi_0(\cos\delta,\ i\sin\delta)$ (circular spin cycle, longitude)	

4	Phase angle/four representations	$\delta(t,\ r) = 2\pi(r/\lambda - vt) = (pr - Et)/\hbar' = kr - t$ $(\hbar' \geq \hbar,\ 0 \leq v \leq c)$	$(\hbar' \geq \hbar\ \ 0 \leq v \leq c)$ $1/\mu\varepsilon = v2;$
5	S-T vector pair	$S = (1/\mu\varepsilon)T,\ S = H \times E,\ T = B \times D;\ 1/\mu\varepsilon = v2;$ $(\hbar' \geq \hbar,\ 0 \leq v \leq c)$	
6	Fig. 10-3f: binary (M, m) sub-system field.		

The true meaning and core of Fig. 10-3f is the common nature of human beings, which complies with common living experience of humanity and obeys humanity's natural understanding and thinking habits. Using the "Tai Chi diagram", we can intuitively understand, recognize, and appreciate the information found in the eight-diagram model. The natural and cognitive thinking habits of humans, however, are given by nature. Using things familiar to people as the materials and based on people's usual habits of thought, we can express meanings and concepts that people can understand according to their experiences. These can be easily perceived by people, allowing science to develop from a new starting point and to new heights.

CHAPTER 11

THE BASIS OF SPIN DYNAMICS IN LIYI TAI CHI

Abstract: The Tai Chi Yin and Yang theory of Taoism, the complex vectors of Western mathematics, and Maxwell's theory of electromagnetic fields all display similarity. These topics bridge many disciplines, including relativity, quantum theory, and Newtonian mechanics, and constitute a system of theoretical physics that can enable profound reasoning on the essence of higher-level morality.

Introductory pictures:

Fig. 11-1. Pyramid-shaped spiral

Fig. 11-2. Space celestial body

Fig. 11-3. The "middle curve"

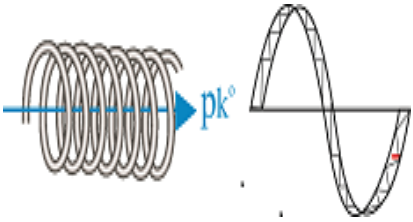


Fig. 11-4. Electromagnetic waves propagate in a spiral

11.1 The spin dynamics basis of Liyi Tai Chi

Neither the Western concept of linear time, nor the periodic space-time theory of Eastern religions can fully explain the concepts of time, space, matter, and causality; nor can either of these concepts fully reflect the meaning of the kinetic phenomena of "spins" and "spin arrays". All objects in the universe rotate. For example, electrons rotate around the nuclei of atoms, the earth revolves around the sun, and the sun revolves around the galactic center. Consequently, rotation is the most fundamental property of the universe. Among the iconic images representing human thought and philosophy (Fig. 8-1), Tai Chi presents a beautiful configuration. When the "Tai Chi Yin and Yang" icon is observed in three-dimensional space, rather than in a plane, the boundary line between Yin and Yang exhibits similarity to the spin S periodic curve of (generalized) electromagnetic waves. If the head and tail are "connected by spin", then a circular spinning cycle (rather than a full cycle) will be formed. Everything, from the macro to the micro-universe, rotates regularly. Liyi theory espouses the belief that, for particles (here referring to all things), mass, energy, time, and space are all one. Maxwell's electromagnetic equations can be interpreted according to the traditional Eastern Yi philosophy and the Li Yin and Yang theory of four images and five elements to reveal the rule for the spinning circular periodic

nature of everything. They exhibit the principles and mechanisms of Liyi spin dynamics, thereby constructing a decapartite time-space concept.

When discussing the four-element theory time-space concept in previous sections, we applied methods of recognition and the unity of "Yi theory, physics, and mathematics" (which Can be called a "Sancai" idea for the sake of brevity) to establish a bridge between matter and thought. Sancai has three meanings. First, there is "Yi theory", meaning that "Yi" has three principles: "not easy", "becoming easy", and "simple and easy". We consider the grand laws and theories of the universe as universal standards that do not change. The basic properties of the universe, namely, "truth, goodness, and fruitfulness", are the moral standards of human society and the source of all matter and spirit. Next, we consider physics and mathematics. Physics studies motion, change, and physical laws related to everything in the universe. Physics cannot be separated from mathematics, and breakthroughs in physics are often based on mathematics. "Simple and easy" is a basic principle and refers to the idea that a thing is easy and simple because it follows the rules of the world. A thing that is "simple and easy" will become extremely simple and extremely easy to do. Because the "simple and easy" concept is indeed easy and simple, it is understood and accepted by common people and will achieve good results. A concept that is "simple and easy" obeys causality.

Physical Yi field theory holds that things exist in a holographic relationship with each other, in which the part reflects the whole, uniting information about the entirety. "Yi" also has another aspect, one that is mostly neglected by modern empirical science. This aspect concerns the variations of Yin and Yang, the moving and the static, and the circulation of all things in a manner that is regular and stratified. Regarding the unity of its particle/wave-particle, field, rotational, and periodic nature, light is a wave and waves exhibit rotation, implying both periodicity and regularity. If a particle's energy is high, then its frequency is high, its period is short, its wavelength is short, and the particle is small. In addition to studying

objects themselves, the approach of Liyi also investigates the relationships between objects. In this chapter, new concepts will be introduced that will aid in interpreting Maxwell's equations (III).

11.2 Construction of the decapartite time-space concept

11.2.1 The time-space concept used in Liyi four-image theory

All particles exist in time and space, and time and space exist in the form of fields. Time and space cannot exist without matter. Like mass and energy, time and space have size and length and are both independent and related. Particles cannot be separated from their medium/carrier. For moving-body particles and medium particles, with one in motion and one at rest, two binary multi-dimensional time-spaces are combined, constituting a multi-dimensional theoretical four-element system. Liyi theory espouses the belief that energy and time exist in a reciprocal relationship and that momentum and space also exist in a reciprocal relationship. In addition, the parameters of the characteristics of the trinity of mass, electricity, and magnetism are also expressed in "reciprocal" ways, thus complying with the Newton-Cauchy theory of limits, in other words, the idea that the maximum and minimum are both variable concepts (see Table 11-1).

Table 11-1. Particle Yin-Yang/four-image time-space and limit laws.

1	**Time-space transformation law**	**$D=\lambda$, $T=1/\nu$ (λ - wavelength, ν - frequency, T - temporal period, D - spatial period)**
2	Velocity and time (T) space (D)	$v=D/T=\lambda\nu$ Kinetic parameter: $0\leq v\leq c;\ h'>h$
3	Energy, momentum, and time-space	$E=mv^2=h'\nu=h'/T;\ p=mv=h'/D=h'/\lambda$

4	Time-space variable	Time-space limit	Limit operational rule
(1)	Particle time-space (T, D)	$1/D \to 0,\ \infty,$ $1/T \to (0,\ \infty)$	$v = D/T$ $= (1/T)/(1/D)$
(2)	Carrier medium time-space (t, r)	$\Delta t(t) \to \eta(0,\ \infty)$	$0 \cdot \infty \to$ finite
(3)	Time-space interval (Δt, Δr)	$\Delta r(r) \to \xi(0,\ \infty)$	$0/0 \to$ finite
(4)	Second-order time-space variables $1/\mu$ and $1/\varepsilon$	$1/\varepsilon(0,\ \infty)$; $1/\mu\ (0,\ \infty)$; $1/\Omega(0,\ \infty)$;	
(5)	Triune nature of mass, electricity, and magnetism		

Liyi theory studies the reality of particles (i.e., everything); accordingly, based on the appropriate mathematical models, the theory effectively avoids the problem of "singularity" in science. Everything in the world is comprised of molecules and molecules are composed of atoms, electrons, sub-atomic, and other very small particles. Besides, particles are composed of time and space because time and space exist inside them. In the universe, a small particle has higher energy, density, and interactive force, and therefore, the particle is more stable.

11.2.2 Construction of the decapartite time-space concept of the universe

Based on the time-space concept used in Liyi four-image theory, the Liyi framework introduces the concept of complex energy time-space into the discussion of the differential equilibrium law/equation of complex energy for particles (i.e., the Schrödinger wave equation). Together with the

mechanism of Liyi rotational mechanics, we can establish a decapartite time-space concept of the world, as shown in Fig. 11-5. With a rotational axis at the center, the four faces have eight directions. The decapartite universe is formed by combining these eight directions with the directions of up and down.

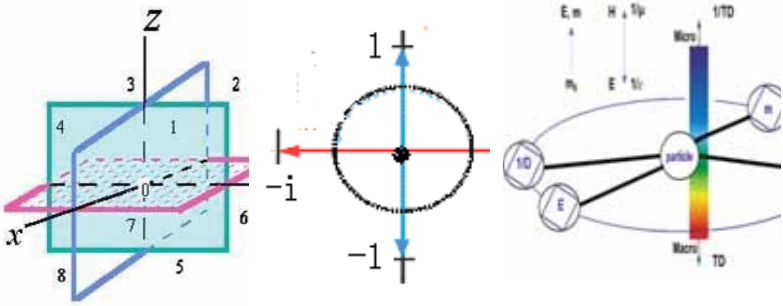


Fig. 11-5a. Fig. 11-5b.

Fig. 11-5. Diagram of the structural elements in the decapartite time-space view of Liyi theory. a): three-dimensional quaternary complex plane: the X (imaginary) axis and the Y (real) axis constitute the complex plane; 2) the imaginary X-axis (**i**, **-i**) corresponds to time and space, whereas the real Y-axis (**1**, **-1**) corresponds to mass and energy, and the Z-axis is the longitudinal axis through the center. b): diagram of the macroscale and microscale time-space views of the decapartite universe (the arrow → points in the direction of an increase in a physical quantity; a decrease occurs in the reverse direction).

The characteristics used to construct the decapartite time-space concept are as follows:

1) The complex latitudinal plane and the longitudinal central rotation axis divide time and space into eight octants (i.e., eight directions) and the up and down directions are added to constitute the decapartite world.

2) The central axis rotates.

3) All cosmic celestial bodies have an outer shell regardless of how large they are; they behave as spherical rotating bodies.

4) in analogy to the Chinese character "十", the vertical "—" is the largest real axis, containing heaven and earth, positive and negative, and Yin and Yang; the horizontal "—" is the image axis, which constitutes the complex plane of Tai Chi Yin and Yang; and the rotational axis at the center completes the decapartite world, which contains everything in the universe. The relevant physical and mathematical variables are summarized in Table 11-2.

Table 11-2. Relevant 13-element (or 26-element) system of primary physical elements.

	Name (Number of Variables)	**Physics and Mathematics Symbols**
1	Particle Yin-Yang mass-energy-time-space four-image theory (4×2)	Particle Yin-Yang mass-energy-time-space four-image theory: m, E, $1/T$, $1/D$
2	+ Particle yin-yang magnetism-electricity-time-space four-image theory (4×2)	Particle Yin-Yang magnetism-electricity-time-space four-image theory: H, $1/\mu$, E, $1/\varepsilon$
3	+ Carrier medium time-space (2×2)	Carrier medium time-space variables: t, r
4	+ Tripartite nature of mass, electricity, and magnetism (1(=3-2)×2)	$1/\Omega$, $(1/\varepsilon, 1/\mu)$
5	+ (Interactive) potential function (1×2)	$V(r)$
6	+ Characteristics of the universe (1×2)	"13" - the number of variables, also referring to the characteristics of the universe

Total	13×2=26. The numbers and symbols and their combinations have special meanings here. Each symbol is a variable. Each variable has a domain and range, i.e., it is associated with a variable representing its stated limits.

Every digit and symbol is a biological body that contains matter and has certain characteristics and features. These bio-bodies can be brought into many types of combinations, representing living organisms. Through Yi theory, physics, and mathematics and the dialectical connection of Yin, Yang, and *Bagang*, we can construct a symmetric, harmonious, and equilibrium-ordered body.

11.2.3 Calculus, time-space limit, and laws of variables

Physical Yi theory studies all things and laws by considering their changes. The mathematical basis of the theory is calculus and includes integration and differentiation. When we use the method of integrating a differential equation to solve for the original function, we must apply conceptual limits to determine and verify the boundary conditions. Cauchy believed that the infinitesimals used should be as small as possible; therefore, it acts as a zero-limit variable. Similarly, an infinitely large concept is also a variable and the limit of this variable is a certain large quantity. For example, the relationship between the velocity of the particle and its time-space field is $v = D/T = (1/T)/(1/D)$; at extremely small scales of time and space, even when T (or D) approaches (but is not equal to) 0, its reciprocal $1/T$ (or $1/D$) approaches ∞, whereas $\mathrm{E} \propto 1/\mathrm{T}$ (or momentum $p \propto 1/D$). In other words, for small particles, the dimension of the time-space field is small, while energy and density are large; this statement is also true for time-space intervals. We should not doubt the scientific spirit of symbolic logic that prevails in the world. The rules of multiplication and division for the limits of physical quantities are as

follows: $\infty \cdot 0 \rightarrow \eta; 0 / 0 \rightarrow \eta$.

Here, the operations of multiplication and division on the limits of physical quantities, η, are also limited to different individuals in the same system. The limited quantity, η, is also a variable. This is entirely analogous to the phenomenon in which other people have different limiting distances of distinct vision.

11.2.4 Characteristics of the decapartite space-time concept

The primary obstacle to the progress of science is human perception. Once this perception changes, we are often surprised to find that much evidence contradicts the old theory and supports the new theories, but people had not seen nor dared to imagine any possibility beyond the old system based on these facts. If the new science wishes to understand the essence and truth of the universe, matter, space-time, and life, then it cannot progress solely based on the concept of visible space-time as observed by empirical science. Both time and space are manifestations of energy and are consistent with the mass-energy-time-space four-image concept of Li Yin and Yang. The space-time concept in the new four-element theory is based on the tripartite wave-particle-field nature of particles; this is also the case for electromagnetic particles. To discuss particles and quantum mechanics, Liyi theory introduces the concepts of complex energy and complex space-time, based on the mathematical concepts of complex numbers and vectors in Western thought. Real space-time and complex space-time cross each other along the central rotation axis. The resulting eight directions, in combination with up and down, constitute the decapartite space-time concept. This theory complies with the cosmological theories of both Buddhism and Taoism.

The space-time concept adopted in Liyi theory encompasses the concept of complex space-time, which can no longer be visualized in the form preferred by current science. The macro and microscales are connected

and everything is alive. Future science will study everything as various forms of life and use the concept of "life" to unify matter and spirit, matter and energy, particles and vacant space, discontinuity and continuity, time and space, and the center and its surroundings. Therefore, future science will be truly inclusive and will not divide things. This science will inherit the basic ideas of traditional science regarding "the spirit of everything" and will no longer separate matter from life. Instead, matter and life will be treated as united entities.

The physical Yi field theory recognizes that people differ in their understanding of truth in the universe. The derivation of Yi mathematics is primarily based on differential calculus and is achieved through solving boundary conditions. Mathematical symbols with definitive physical meanings render many concepts clear and simple, and the logic involved renders the tumultuous world precise, rational, and ordered.

The macrocosm that our eyes can see constitutes only a very small part of real space. Modern empirical science is able to consider only those issues related to surface material space, but Liyi theory uses this space to integrate theorems, laws, and formulas that can describe the characteristics and rules of other spaces.

11.3 A possible solution for the mystery of the "black hole"

11.3.1 Basic equations of Liyi cyclic spin dynamics

The mathematical expression for the YN (gravitational field) equilibrium interactive force law of uniform circular motion is as follows:

$$\mathrm{m}v^2/r = -\mathrm{GMm}/r^2 \ (i.e. f_{YN} = -f_{YN}^{'}) \qquad (11\text{-}1)$$

$$\Delta V(r)/\Delta r = -GMm/r^2 = -f_{YN}^{'} \qquad (11\text{-}1')$$

Equation (11-1) reveals that, in a gravitational potential field (M), the condition in which any moving particle (m) is traveling around the geomagnetic axis with a uniform circular motion is subject to the effects of the different natures of two equilibrium forces. One is centrifugal force, f_{YN}, and the other is centripetal force, $f_{YN}^{'}$. These two equal and opposing forces act along the same line upon the same body in motion (m). The direction of travel of the moving body is perpendicular to the directions of these two equilibrium interactive forces (i.e., the tangential direction of the circular orbit).

Using Field Theory IV, referring to Newton's theory of mechanics, the left-hand side of the circular motion equation can be expressed as follows:

$$f_{YN} = m\Delta v/\Delta t = ma = mv^2/r$$
$$\therefore a = \Delta v/\Delta t = v^2/r \ (\Delta v > 0) \qquad (11\text{-}2)$$

where a is centrifugal acceleration (in the direction pointing away from the center of the earth). The right-hand side of equation (11-1) represents the driving force of the moving body's circular motion ("external force"); its direction points towards the center of the earth and it is also referred to as the centripetal force:

$$f_{YN}^{'} = v\Delta m/\Delta t = GMm/r^2 = mg,$$
$$g = GM/r^2 \ (\Delta m \leq 0) \qquad (11\text{-}3)$$

Thus, solving these two simultaneous equations, we obtain $g = -a = -\Delta v/\Delta t$, $\therefore G = -(r^2/M)\Delta v/\Delta t = (r^2/M)g$. Here, g is centripetal acceleration (in the direction pointing towards the center of the earth). Equation (11-1) explains three points:

(1) In the formula, m, v, and r are all independent but correlated variables.

(2) According to Liyi magnetic element theory, the essence of gravity is as a magnetic force. The more microscopic the particles are, the stronger and more significant the magnetic property of the material becomes. In

equation (11-1'), the left-hand side represents gravity and the gravity of $f_{YN}^{'} = GMm/r^2 \propto m$ is proportional to m and $1/r^2$; the right-hand side represents the magnetic force $= \Delta V(r)/\Delta r$. The magnetic force is the source of power and is large. On the one hand, this shows that the radial rate of change in the interactive potential is high; on the other hand, this shows that the large gravity on the right-hand side is not due to the large mass (m) of the moving body, but rather because the magnetic property is great, which causes $1/r^2$ to be large.

(3) Dual observation system: $\langle m\rangle \in \langle M|m\rangle$, $m \ll M$; $v^{'} M \approx 0$, $m \ll M$, $v \geq 0$.

11.3.2 Analysis of the theory of relativity on the great wheel

Fig. 11-6. Theory of relativity on the great wheel (network diagram)

Fig. 11-6 shows an illustration of the "theory of relativity on the great wheel". The equation of motion in mechanics is as follows:

$$\mathrm{m}v^2/r = -mg \qquad (11\text{-}4)$$

In this formula, the centrifugal acceleration is $a = v^2/r$. Gravity, i.e., gravitational acceleration, is $g = -\Delta v/\Delta t$, or $a = -g$. Thus, the

following points can be explained:

First, in terms of a macroscopic high-speed rotating body, if the gravitational acceleration, g, remains unchanged, then a also does not change. Because $v^2 \propto 1/r$, the energy is $E = mv^2 \propto 1/r$. Therefore, as a large, high-speed rotating wheel becomes oriented more toward the center, a higher rotational velocity of the material particles corresponds to higher energy. Similarly, high-energy particles converge toward the center. Second, any high-speed rotating body in space is also an electromagnet. Meanwhile, the predominant trend of high-speed microcosmic particles is towards the center. Therefore, the center has the highest energy and the so-called "black hole" phenomenon appears. Third, a high-speed electromagnetic rotating body (such as the earth) always rotates around its magnetic axis (non-gravitational axis). The center has high energy and thus an aurora phenomenon appears.

11.3.3 Theoretical explanation of the "black hole" phenomenon

Theorem 1: Any high-speed rotating object that rotates around an axis is subject to the action of two forces: one is a centrifugal force; the other is a centripetal force. These two forces are equal in magnitude, but opposite in direction. They act on the same object, causing the object to move in a uniform and circular manner around the circumference. These two forces act in a horizontal and a lateral direction. The longitudinal direction depends on the material and energy distribution of the potential/force field.

Theorem 2: Liyi magnetic element theory states that 10,000 substances have a single electromagnetic body with a magnetic core. The essence of gravity is magnetism at the molecular level, consistent with the inverse square law of distance pointing towards the earth's center. This molecular-level gravity/magnetism is a long-range force. Atomic-level "gravity" has the nature of electricity (the interactive force between positive and negative charges) and acts as a short-range force that points in the

direction towards the atomic core. The essence of the subatomic-level "gravity" of a substance is magnetism—a short-range force pointing towards the subatomic core. The concepts of so-called "dark matter" and "dark energy" in modern empirical science are revealed in the first principle of energy of Liyi theory. The mass-energy-time-space four-image unity means that mass and energy cannot be discussed on their own, separately from time and space. As time and space become more microscopic, the material has higher energy, greater density, stronger magnetism, a greater interactive force, and a more stable structure. Modern scientists have confirmed that the magnetic field outside a black hole is 10,000 times higher than that of the earth.

Theorem 3: *The problem of electromagnetic radiation*. A high-speed rotating body is composed of macroscopic cosmic particles, molecules, atoms, and other microcosmic particles, which maintain their equilibrium/steady-state via many different motion states and, intentionally or unintentionally, absorb energy or emit excess energy. The corresponding radiation varies and may include (low-frequency) gravity wave radiation, acoustic radiation, and light radiation at various frequencies—called generalized electromagnetic radiation. The electromagnetism considered in Liyi Theory is generalized and is not limited in application to electromagnetic particles traveling at the speed of light. Various celestial bodies will release electromagnetic radiation. Only a small portion of this radiation appears as visible light. The major part is invisible.

Thus far, Einstein, Hawking, and other brilliant cosmologists have all failed to understand that the gravitational force is not the most influential force in the universe; there is also a repulsive force. As the YN equilibrium interactive force law of uniform circular motion reveals, there must be two interactive forces with different properties for the rotation of any moving particle, (m), around a geomagnetic axis with a uniform circular motion in a gravitational potential field, (M). One is centrifugal force and the other is centripetal force. These two equal and opposite forces act along the same

line upon the same body in motion, (m). The moving body's direction is perpendicular to these two interactive equilibrium forces (i.e., the tangential direction of the circular orbit).

However, there are two critical prerequisites for the YN law of uniform circular motion: i) there must be a larger celestial system acting as the background, $\langle M|m\rangle$, $\langle m\rangle \in \langle M|m\rangle$, $m \ll M$; $v^{'} M \approx 0$, $m \ll M$, $v \geq 0$ (dual observation system) and ii) it is impossible to maintain the conservation of momentum and field momentum through rotation only.

11.3.4 Spin and revolution mechanisms

As mentioned above, the earth is both a particle and a wave and where there is a wave, there is spin. In Fig. 11-7, the depiction of the earth's rotation and its revolution around the sun via an S-spin cyclical mechanism reveals the following:

(1) *Rotation mechanism*: according to the universal law of interactive forces, $f_{YN}^{'} \propto 1/r^2$ (see equation (11-1)), the distances from the earth's Tai Chi faces of Yin (night) and Yang (day) to the sun are different and, therefore, they are subject to different magnitudes of interactive force from the Sun: $f_{day}^{'} \propto 1/(r-R)^2$ and $f_{night}^{'} \propto 1/(r+R)^2$, $f_{day}^{'} > f_{night}^{'}$. This forms a rotational pair of forces from west to east driving the earth's rotation around the magnetic axis.

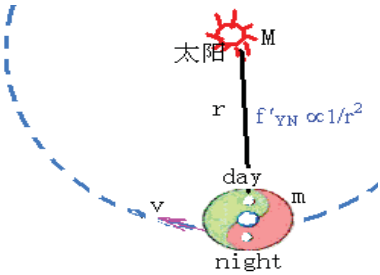


Fig. 11-7. Dynamic rotation/revolution trajectory of the earth:

$f_{day}^{'} \propto 1/(r-R)^2$, $f_{night}^{'} \propto 1/(r+R)^2$, $\therefore f_{day}^{'} > f_{night}^{'}$

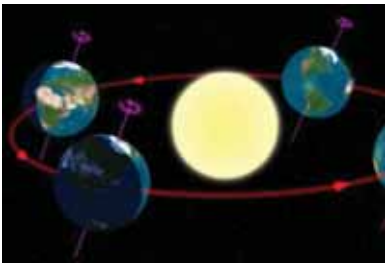


Fig. 11-8. The Yang face always faces the sun, whereas the Yin face faces away from the sun

(2) *Revolution mechanism*: according to the YN equilibrium interactive force law of uniform circular motion, $mv^2/r = -GMm/r^2$ $(i.e. f_{YN} = -f_{YN}^{'})$ and the uniform centripetal acceleration is $a = v^2/r$. This illustrates that the repulsive force of the earth's high-speed circular motion, f_{YN}, is in equilibrium with the sun's attractive force, $f_{YN}^{'}$; therefore, the earth moves along a circular orbit at a uniform velocity (v): $v = v(t,\ r)(= D/T)$. Here, T is the temporal cycle/day and D is the spatial cycle/day.

(3) The earth rotates from west to east in the same direction as its revolution. This rotation and revolution complement each other and they are mutually generated. According to the principle/law of equilibrium interactive potential force, $\Delta V(r)/\Delta r = -GMm/r^2 = -f_{YN}^{'}$, we can see that the true source of power for the earth's rotation is the interactive force with the sun, i.e., the radial rate of change in the interactive potential energy between the two, which is a type of magnetic force. As shown in Fig. 11-7, the earth is continually rotating day and night, but the earth's Yang face

always faces the sun, whereas its Yin face is always looking away from the sun.

Macroscopic and microscopic principles are linked. An electron revolves around the atomic nucleus while rotating around itself for the same reason. Furthermore, human beings also revolve around the sun many times along with the earth, without ever feeling this motion. Empirical science and Eastern and Western religions both state that the earth goes “around in a circle”, but it is a “circular spin” because time and space are two. The earth has a “central + electromagnetic axis”, with two-fold symmetry. The earth’s main axis is its electromagnetic axis, whereas its gravitational axis is the counterpart.

The mechanisms of rotation and revolution of the earth reveal that Tai Chi symbols provide a perfect representation of the situation. The basic characteristic of these Tai Chi symbols is a periodic circular spinning shape. The aesthetic features of this circular spin of Tai Chi are widely recognized. Such a symbol represents a still and serene surface that is forever in a state of perpetual motion. It follows the most beautiful possible trajectory in a mutually complementary and perpetually moving state. Moreover, as an observational system, Liyi theory uses a dual subsystem that satisfies the laws of Yin and Yang, stillness and motion, which is a crucial aspect of the Liyi approach.

11.4 Atomic structure and stability

11.4.1 Atoms contain a core and are layered, spherical, stable bodies

Atoms possess two (high and low) marginal energy fields. The inner shell layers of an atom are spaced according to their potentials (potential energy and energy of position). When a layer is closer to the center (high-energy margin, $r \rightarrow 0$), its potential energy is higher; when a layer is closer

to the low-energy field margin, its potential energy is lower; when a layer is near the margin of the atom, it has the same potential as the margin of the molecule. Atoms exhibit a beautiful spherical structure. The spherical structure is very stable, but it is not closed; the system contracts in its interior and expands at its exterior, and the atom's absorption and emission of energy follow specific rules.

11.4.2 Explanation of atomic stability

Atoms (and, in fact, all things) maintain energetic equilibrium and stability. Light originates from the second type of characteristics of the organization of matter, and matter consists of atoms. Atoms (type I characteristics) are spherical, layered bodies of mass, electricity, and magnetism that contain a core. Atoms are composed of electrons and a nucleus. The nucleus is very small, but has very high energy. The potential energy is also very high and is concentrated at the center of the spherical atom; outside the nucleus, a series of separate spherical layers, termed energy levels, are distributed. These energy levels constitute the primary characteristic structure of atoms; moreover, we can express the differences between different energy levels and the potential energy levels between individual electron layers with respect to the nucleus as E (or V). These differences are also intrinsic to matter and are secondary characteristics of its structure. The nature of these energy and potential differences is that of energy intervals between electromagnetic fields, called gap particles, virtual particles, latent particles, or string particles; these particles that are associated with molecular layers are regarded as particles that participate in chemical bonding. Negative particles (Einstein termed these "vibrators") also have specific mass-energy-time-space four-image properties and a tripartite wave-particle-field nature. Hence, these negative particles are the source of many types of light/radiation. When these latent particles (which are confined inside the body of matter) are excited and radiate out from an

object, they become real particles. Light particles possess, by nature, mass-energy-time-space four-image properties and a tripartite wave-particle-field nature.

Heat, light, electromagnetism, and almost everything else can all be explained using the same theory and are all related to potential fields and forces. These forces include electromagnetic force. When a system is excited by energy at the same frequency as the system, or by sufficient energy, the system will radiate and the energy will be discrete and quantized. This is true for light/electromagnetic radiation and gases, heat, light, and electromagnetic waves; volatilization, evaporation, vaporization, and radiation are all similar processes. Hence, they are all united by a concept called generalized electromagnetic radiation. The Yin and Yang properties of everything are continuously changing. The equilibrium between Yin and Yang forms stable structures; however, the variations of Yin and Yang also continually destroy the initial stable structures.

11.4.3 Light is the key that reveals mysteries of the universe

The scientific classification of light is based on its color, i.e., colorless, colored, purple, indigo, blue, green, yellow, orange, or red; the frequency gradually decreases in the following order: colorless > colored > purple > indigo > blue > green > yellow > orange > red. These colors correspond to relationships at the level of the structure of matter. Here, “colored” lies between colorless radiation (such as X-rays) and ultraviolet light; the frequency of such light is higher than that of ultraviolet light. In science, this spectral region is defined as the ultraviolet spectrum region of free space. That is, “colored (light)” is the real presence of matter. In practice, people will view it as “white”, transparent light. Science ignores the existence of this light because it “cannot be seen”. In science, this so-called “white light” is a secondary color. The nine different colors of light are associated with different levels. Light is the key to opening the gate to the mysteries of the

universe.

In empirical science, light particles are considered to have no mass and only possess magnetism and not electrical energy. Alternatively, it is also said that light particles have only electricity and not magnetism. These statements are incorrect. The former statement that light particles do not have mass is contrary to Li Yin and Yang; the latter statement that light particles do not have electrical energy is also contrary to the magnetism-electricity-time-space four-image principle of Li Yin and Yang. Einstein's principle of the invariance of the speed of light is valid throughout all branches of science. The principles and laws of the universe are connected and constantly growing. The sub-atomic structure, which is addressed in high-energy physics, is quite similar to the atomic structure. A sub-atomic structure is a high-energy, layered body of mass, electricity, and magnetism that contains a core; regarding the intervening secondary characteristics of this structure, the energy differences and potential differences are fundamentally related to gap particles, also called latent or string particles. When particles are excited, they emit electromagnetic radiation, including high-energy electromagnetic radiation. The velocities of particles of high-energy radiation exceed the speed of light and exhibit strong magnetic properties. High-energy physical experiments confirm that the wave velocity of neutrinos is not much higher than the speed of light, but these particles are extremely penetrating. This indicates that the magnetism and mass-magnetism of these particles are much stronger than those of light particles.

11.5 Perfecting the four laws of Newtonian mechanics

Table 11-3. The four laws of Newtonian mechanics.

1	Newton's first law states that **an object in a state of uniform motion simultaneously consumes kinetic energy (or internal energy). The essence of the first law is energy. Uniform motion will consume kinetic energy or internal energy, ($E_k = 1/2mv^2 \neq 0$).**
2	**Newton's second law has two forms:** (i) $F = \Delta p/\Delta t = m\Delta v/\Delta t + v\Delta m/\Delta t$ and (ii) $F = m\Delta v/\Delta t = ma$. The two conditions expressed in (i) and (ii) are correlated. Neither can replace the other. If $\Delta m \neq 0$ in the former, then this equation already contains the concept of the theory of relativity.
3	**Newton's third law:** any action is mutual. The force of action is equal to the force of reaction and acts upon two different objects: $F_1 = -F_2$. This expression is inferred from the universal law of interaction: $F_1 = k(x_1/r^2)x_2$ $F_2 = k(x_2/r^2)x_1$
4	**Newton's law of circular motion:** under the action of an equilibrium force with an equal magnitude, but opposite direction, a body in motion (m) moves in a circle around the nucleus. The equation describing this movement is $\mathrm{E} = \mathrm{m}v^2/r$. The nature of this circular motion is energy. The interactive equilibrium force plays a role in controlling the orbit. Like rural Chinese villagers pushing a millstone, the equilibrium interactive force is a mechanism; of course, this mechanism is a different embodiment of energy. Newton also recognized that this rotational mechanism is visible, as is the millstone. Invisible mechanisms exist in the form of fields and most of these mechanisms are invisible.

To improve and enhance Newton's laws of motion, they can be combined with field-oriented concepts and the connotations of the theory of relativity. Forces are not the only factors that affect movement; such factors also include energy and the concept of internal time and space. Therefore, such problems are also problems of dynamics, although greater emphasis is placed on movement and force.

These four laws are universal and are collectively called Newton's four laws. They consistently take up an important position in Liyi field theory. Newton's theory originally contained no circular law of motion. This fourth circular motion law is an evolution of Newton's second law.

CONCLUDING REMARKS

A "GRAND UNIFIED THEORY" IS NOT A FAINT HOPE

In the 1930s, Einstein began to study the Grand Unified Theory, attempting to unify the four mutual interactions discovered into a single theoretical framework and, therefore, find the origin of these four interactions. By the end of his life, Einstein had not yet succeeded. However, the concepts of "the natural world should satisfy the principle of simplicity" and "unity" are deeply rooted in our thoughts and the goal of establishing a unified theory has attracted thousands of physicists. However, there has been no success so far, mainly because it is impossible to unify the electromagnetic force and gravity.

A real scientific system should contain a set of systematic theoretical principles, rigorous research methods, and logical approaches that are interconnected, harmonious, and ordered. The field theory of physical Yi theory is also called Liyi. We can use Liyi dynamics to investigate the relationships between matter, motion, force, energy, and the equilibrium/conservation law. We first need to verify whether it complies with the energy conservation principle and the equilibrium law for each new theory. The energy involved in Liyi includes many forms, such as energy, momentum, kinetic energy, potential energy/interactive potential energy, and the functions of electromagnetic waves. These are all conserved

quantities, variables, and functions, and they can be connected to deduce the law of energy conservation and transformation, which includes three aspects.

First, the Li Yin-Yang four-image and five-element approach recognizes that particles (i.e., everything that exists) have a tripartite wave-particle-field nature. The establishment of the Liyi time-space concept of the theory of quaternions perfectly integrates the characteristics of mass-energy-time-space in a single entity consistent with the concept of the Li Yin-Yang principle of the mass-energy-time-space four-image property. The establishment of a set of fundamental dynamic systems includes four aspects:

- The first principle of energy/law/equations of relativistic mechanics.
- The Li Yin-Yang interactive potential/principle/law/equations of force conservation/equilibrium.
- The principle of momentum-field momentum conservation/YN law of equilibrium force-uniform circular motion.
- The principle of complex energy conservation/law/equation of wave in quantum mechanics (i.e., the Schrödinger wave equation).

The four fundamental principles/laws/equations of Liyi are independent and related, having a complementary relationship. They fundamentally eliminate the apparent conflict between Newton’s mechanics and electromagnetic theory and relieve “the conflict between relativity and quantum theory”. Moreover, the fifth term corresponds to the principle/law of field-resonant dynamics in the matter field, which reveals that the particle has the resonance and rotary circular periodicity of a wave-particle-field.

Second, Maxwell’s algebraic equations of magnetic and electric rotary dynamics are interpreted to include the following: (1) the general law of rotary circular periodic propagation for electromagnetic waves; (2) the YM magnetic and electric (force/energy) equilibrium law (to unify the four major forces); and (3) the further establishment of the time-space concept of the world.

Third, the Liyi Tai Chi theory of rotary dynamics opens a gate to the Yi theory of the united field, enabling science to develop from a new starting point and to new heights. The first and second of the Li Yin-Yang four images and five elements possess the conditions to constitute eight diagrams of physical Yi theory.

As a new discipline, physical Yi field theory stands out for two reasons: the first is that it follows the correct principles, while the second is that it allows us to reasonably select a dual observation system. These analytical methods "avoid the current complicated procedures and take the same steps without losing the principles". However, avoiding such complicated procedures and taking the same steps is conditional. There is also the principle of three-Yi: "not easy"; "becoming easy"; and "simple and easy". These comply with the nature of causality. We can thus establish a bridge between matter and thinking according to the cognitive methodology of Yi connotation-physical connotation-mathematical connotation (also called the "three talents"). The universe is harmonious and unified. Liyi theory allows us to directly study particles (i.e., everything). The study of the rule of existence and motion of particles must involve a dynamic problem. Real science recognizes that matter and its properties are singular in nature and united. It grasps the essence of things and provides us with systematic knowledge that correctly reflects nature and the laws of nature, society, and thinking.

For more than two decades, Eastern and Western scientists, and humankind generally, have been dedicated to overcoming the notions of evolutionists and atheists, going beyond the confinement of empirical science and looking for an opportunity to unite ancient and current Eastern and Western science and culture. We can conclude that Yi theory is the discipline with the strongest capability to understand time and space since humans have appeared on earth. Liyi originates from laws of nature and begins from Yin and Yang. Li is the particle and thus refers to everything and everything has Yin and Yang. According to the Eastern traditional

philosophy of Yi theory, Liyi integrates the rational outcomes of Western natural science through four fundamental principles/laws of dynamics using the three-talent thinking methodology of “Yi connotation-physics connotation-mathematics connotation” to form the new Li Yin-Yang model of four images and five elements. It also interprets Maxwell’s magnetic and electric equations to reveal the law of rotary circular periodic motion of electromagnetic particles and constructs the Liyi space-time concept of the entire world, demonstrating the fundamental principle of Tai Chi rotary dynamics.

APPENDIX I:

LIST OF PRINCIPAL SYMBOLS

Li, L—Particle
Yi, Y－Yi Field
LiYi, LY—Li-Yi Field Theory
Y-Y—Yin and Yang
m, M—mass, Mass
E—Energy
P—Momentum
T, D—(Particle) time/space variable
v (=D/T)—Velocity
(t, r)—Carrier/environmental space-time
U—Potential energy
V—Potential energy of interaction
N—“Newton”
X—“Schrodinger”
M—“Maxwell”
E—Electricity
H—Magnetic
I—Imaginary/plural
δ—Phase angle
1/—Magneto-conductivity of (monochrome) magnetoelectric medium
1/—Magneto-conductivity of (monochrome) magnetoelectric medium
1/με—Square of rate
E_k—kinetic energy
Δ—Differential sign

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