

Dao and the Tri-State: The Dual Spiral Spring Theory—A Meta-Model of System Dynamic Equilibrium

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Abstract

Inspired by the double-spiral pattern on a terracotta-colored pottery bottle from the Neolithic Age, this study transcends traditional archaeological and art-historical interpretations to construct a meta-model named the “Tri-State Theory of the Dual Spiral Spring.” Using a pair of rigidly connected spiral springs as its core metaphor, the model distills three fundamental states of a system — Equilibrium State, Tightening State, and Loosening State—and reveals the law of their dynamic cycle.

The research first establishes the mathematical and physical foundations of the model, demonstrating that it can be simplified to a linear segment as an elemental structure, and its dynamic mechanism can be interpreted through the principle of wave reflection. Building on this, the paper systematically verifies the model's powerful universality: at the micro level, it provides a philosophical schema for the holistic correlation in quantum entanglement; at the macro level, it explains the climatic cycles of Earth and the life-death rhythms of celestial bodies; on the scale of human society, it accurately describes interactive tensions from interpersonal

emotions to international geopolitics; in the field of ecological governance, it offers in-depth analysis of contrasting cases, from the “human retreat leads to desert retreat” miracle in the Mu Us Desert to the embankment breaches at Poyang Lake.

Furthermore, this study achieves a trans-temporal dialogue with ancient Eastern wisdom. The model not only aligns with the ideas of “Reversion is the movement of the Dao; Weakness is the function of the Dao” from the Dao De Jing, but its core framework of “two poles and three states” can also naturally 演绎 the cosmic generative process of “The Dao begets the One; the One begets the Two; the Two beget the Three; the Three beget all things.” It also provides a scientific modeling perspective for the practices in Kan Yu (FengShui) that seek systemic harmony and balance.

In summary, the “Tri-State Theory of the Dual Spiral Spring” is not merely a meta-model with solid mathematical foundations, but also a system thinking paradigm that connects antiquity with modernity and bridges the humanities and sciences. It provides a unified and explanatory framework for understanding dynamic equilibrium phenomena across numerous fields, from nature to human society.

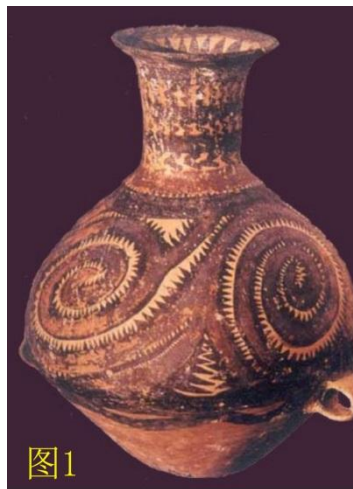
Keywords: Neolithic painted pottery motifs, Dual Spiral Spring model, Tri-State Theory, Meta-model, System Dynamic Equilibrium, Wave Reflection, Linear Segment as Elemental Structure, Quantum Entanglement, Daoist Philosophy, Kan

Yu (FengShui)

Chapter 1: Theoretical Construction

1.1 Prologue: Ancient Motifs and Timeless Intuition

A simple, earth-toned pottery bottle from the Neolithic Age stands in silence. Painted on its belly in a pale yellow pigment are two swirling spiral lines that start from the body, gracefully expand outward, and quietly connect at their ends, forming a closed and perfect loop (see Figure 1).



Its beauty is so pure that we often view it merely as "primitive art." However, as we gaze upon this ancient brushstroke, a timeless intuition emerges: this may not be just a pattern, but a piece of "intellectual heritage" from antiquity, a "schematic" of cosmic structure.

1.2 From Association, Revision, to the Construction of a Meta-Model

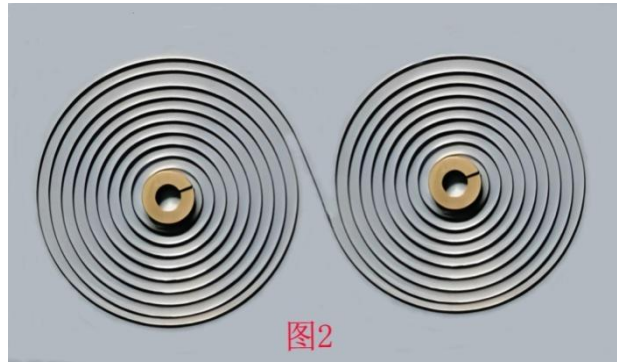
Our intellectual journey begins with a series of associations and self-revisions.

1.2.1 The Ladder and Limits of Association

The initial association points to the DNA double helix — the morphological coincidence is astonishing. However, DNA is a three-dimensional physical entwining, while the pottery motif is a two-dimensional trajectory on a curved surface. Next, we think of quantum entanglement—that mysterious correlation of "one changes, the other responds instantly," which echoes the spirit of the two curves being both independent and synchronized in the motif. But quantum entanglement lacks a traditional "connector."

1.2.2 The Birth of the "Dual Spiral Spring Model" and the Tri-State Theory

The crucial turning point lies in constructing a more precise mechanical model: imagine a pair of spiral springs whose ends are connected by a rigid "linkage rod." This conception transforms an abstract philosophical symbol into a dynamically understandable physical system (see Figure 2).



(1) Absolute Synchrony: In this model, if one spring is tightened, the movement of the linkage rod forces the other spring to be tightened by an equal amount, and vice versa. Their states are absolutely synchronized, constituting a true "community of destiny."

(2) Proposal of the Three States: This system naturally possesses three fundamental states:

- Equilibrium State: The springs are in a stable, naturally extended state with the lowest internal energy, representing the system's harmony and baseline.
- Tightening State: Under external force, the dual springs synchronously tighten, storing potential energy, representing the system's tension, pressure, and inward focus.
- Loosening State: When constraints are released, the dual springs synchronously loosen, releasing potential energy, representing the system's expansion, release, and outward expression.

Thus, the core framework of the "Tri-State Theory of the Dual Spiral Spring" is

established. It depicts not a static equilibrium, but a system archetype containing the potential for all dynamic processes.

1.3 The Mathematical and Physical Cornerstones of the Model: From Geometric Structure to Energy Dynamics

The core structure and dynamics of this model find their concise and profound expression in the most fundamental mathematics and physics.

1.3.1 Geometric Structure: The Line Segment as a Meta-Model

The model's core—"two poles connected rigidly to form an integral system"—finds its simplest expression in a basic concept of Euclidean geometry: a line segment with two endpoints. Here, endpoint A and endpoint B constitute the two poles of the system; the line segment AB itself is the linkage rod ensuring the absolute correlation of the poles. Changes in the system's state are intuitively manifested as the compression (tightening state), elongation (loosening state), or maintenance of the original length (equilibrium state) of the line segment.

This geometric perspective reveals that the "Tri-State Theory of the Dual Spiral Spring" is an abstraction of a fundamental relational structure in the universe, providing an indisputable mathematical basis for the model's universality.

1.3.2 Energy Dynamics: Wave Reflection and "Reversion is the Movement of the Dao"

When moving from static structure to dynamic processes, the model's profound implications are further revealed. If a vibration is excited from one end of the line segment, its energy will be reflected upon reaching the other end. This "rebound" effect is the most direct physical manifestation of "Reversion is the movement of the Dao": any action will induce a reaction, and the system's energy oscillates and cycles incessantly between the two poles.

This process reveals the core mechanism of the model's dynamics: external disturbances are transformed within the system into an energy flow propagating back and forth between the poles, causing the system to continuously vibrate between the "tightening" and "loosening" states. From the resonance of a violin string to the cycles of celestial bodies, all are governed by this fundamental law.

Chapter 2: Verification of Universality (Applications) — The Explanatory Power of a Meta-Model

The true power of an excellent meta-model lies in its explanatory ability across different scales.

2.1 Microscopic Scale: A Philosophical Schema for Quantum Relations

The "Dual Spiral Spring Model" provides an excellent philosophical schema for understanding quantum entanglement. Entangled particles are like this pair of springs; they do not require a traditional "signal" connection because they themselves form an inseparable whole. Measuring one (applying an "external force") instantly determines the state of the entire system (synchronously entering the "tightening" or "loosening" state). It depicts a kind of "connection without a connector," a non-local correlation based on wholeness.

2.2 Macroscopic Scale: The Respiratory Rhythm of Earth and the Cosmos

Earth's climatic vicissitudes are a grand exhibition of the "Tri-State Theory of the Dual Spiral Spring."

- Equilibrium State: The pleasant interglacial periods, with ecosystems in dynamic balance.
- Tightening State: The great ice ages, with the globe frozen and energy "stored" in glaciers.
- Loosening State: Greenhouse periods or extreme heating events, with ice sheets melting and energy violently released.

The cosmos is no different. The stable main-sequence stage of a star, gravitational collapse, and supernova explosions correspond precisely to the cycle of these three

states.

2.3 Social Scale: From Interpersonal Emotions to International Games

2.3.1 Interpersonal Relationships: A healthy relationship lies precisely in the ability to collaboratively experience "tightening" (conflict and pressure) and "loosening" (reconciliation and growth), and to continually return to "balance." One party's emotional tension inevitably transmits through the intangible "linkage rod," triggering a synchronous response in the other.

2.3.2 International Relations: The classic "security dilemma" is accurately depicted by this model. One country strengthening its armaments ("tightening") directly causes an equivalent reaction in its rival (synchronous "tightening") through the "linkage rod" of geopolitics, causing the tension level of the entire system to soar. Diplomatic thaws and cooperation are processes of collaborative "loosening."

2.4 Ecological Governance Scale: Systemic Verification from the Mu Us Desert to the Poyang Lake Embankments

The explanatory power of the "Tri-State Theory of the Dual Spiral Spring" is also evident in major contemporary ecological governance practices in China. Human society and the natural ecological environment constitute a typical dual-spring

system, and their dynamic balance can be precisely described by the "equilibrium-tightening-loosening" triad.

2.4.1 Mu Us Desert: A Benign Return from "Tightening" to "Equilibrium"

The governance of the Mu Us Desert is a paradigm of the model's return from the "Tightening State" to the "Equilibrium State." In the past, excessive reclamation and grazing (the "tightening" of the human society pole) led to the collapse of the vegetation system (the compression of the natural ecology pole) and severe desertification. Subsequently, through initiatives like "converting farmland back to forests and grasslands" (actively "loosening" and regulating the human activity pole), ecological space was returned to nature. The powerful restorative capacity of the natural ecology pole was then released, vegetation recovered, and shifting sands were fixed. Ultimately, the entire system successfully returned from a dangerous "Tightening State" to an "Equilibrium State" characterized by advancing greenery, retreating sand, and harmonious human-land relations. This process vividly illustrates that true "advancement" sometimes lies precisely in wise and measured "retreat." According to a report from the Shaanxi Provincial Forestry Bureau, the treatment rate of desertified land in Yulin has reached 93.24% [1], a result also confirmed by the National Forestry and Grassland Administration [2, 3].

2.4.2 The Cost of Systemic "Tightening": Poyang Lake Embankment Breaches and the

Manifestation of "Reversion is the Movement of the Dao"

The 2024 embankment breaches in the Poyang Lake basin, conversely, validate the model's internal logic. Long-term behaviors like lake reclamation for farmland and encroachment on floodplains (the sustained "tightening" of the human society pole) continuously compressed the flood storage space of the lake wetlands (the loss of elasticity in the natural ecology pole), causing systemic stress to accumulate continuously. When extreme rainfall arrived (massive external energy input), the system released this stress in a destructive manner through embankment breaches (the "retaliatory loosening" of the natural ecology pole). This case profoundly reveals that when a system is excessively "tightened" and loses its elasticity, the consequences of imbalance will inevitably manifest [4-6].

In summary, these contrasting positive and negative cases clearly demonstrate that the "Tri-State Theory of the Dual Spiral Spring" provides profound insights and a viable analytical framework for understanding and regulating the complex giant system of human development and the natural environment.

As the saying goes, "True transmission is on a single sheet of paper; false transmission fills ten thousand volumes." The charm of the "Tri-State Theory of the Dual Spiral Spring" lies precisely in its extreme simplicity of form and profound depth of meaning. It strips away the complex appearances of myriad phenomena, pointing

directly to the core skeleton of system dynamics—relationality, synchrony, and the triad cycle. This model allows us to see clearly that in interpersonal relationships, when one party outputs malice, the other inevitably feeds back malice through the relationship's "linkage rod," causing the system to synchronously enter a tense "Tightening State"; in financial markets, when a bearish signal is widely recognized, it forces the market to synchronously "tighten" through the collective cognition and actions of millions of investors, which is the self-fulfilling prophecy of "when everyone is bearish, even the non-bearish becomes bearish." This simple framework provides us with an elegant way of thinking that reaches the essence for understanding the world.

2.5 Thought Experiment: A Conjecture Towards Cosmic Communication

As the climax of thought, we push the model to an ultimate conjecture: this might be the schematic of a cosmic communication system.

- Information Encoding: Encode information using the ternary code of -1 (tighten), 0 (equilibrium), +1 (loosen).
- Carrier Wave and Modulation: The synchronously oscillating "dual spiral springs" provide a pure carrier wave. The information sequence is loaded by modulating the amplitude of the carrier wave (corresponding to the three states) (or using digital codes compiled from -1, 0, +1).
- Transmission and Reception: The "pyramidal spring on the ship" in the model (—

the pyramidal thread pattern at the center of the pottery bottle) serves as an idealized antenna, responsible for focusing, transmitting, and receiving the modulated signal. A distant receiving system decodes the information by sensing the synchronous forced oscillation of its local "dual spiral springs."

This conjecture suggests that a fundamental information interaction protocol based on tri-state dialectical logic might exist in the universe.

Chapter 3: Philosophical Sublimation and Conclusions

3.1 A Cross-Temporal Dialogue with the Dao De Jing

3.1.1 The Meta-Model's Interpretation of Dao De Jing Passages:

The core ideas of the "Tri-State Theory of the Dual Spiral Spring" constructed in this study find deep resonance in the ancient Chinese philosophical classic, the Dao De Jing. "Reversion is the movement of the Dao" reveals the fundamental law of motion where a system cycles back and forth between the two poles of "tightening" and "loosening," accurately describing the dynamic cyclic process revealed by the model. Meanwhile, "Weakness is the function of the Dao" points out that the most effective way for cosmic laws to operate is to maintain a flexible, unbiased "Equilibrium State," which is precisely the state of lowest internal energy and greatest stability that the dual-spring system pursues.

When this principle of system dynamics is extended to the realm of humanistic values, equally profound echoes can be found. Laozi's saying, "Superior virtue is not (conscious of) virtue, and thus it is virtue. Inferior virtue never loses sight of virtue, and thus it is not virtue," can be exquisitely interpreted within this model.

Here, "virtue" (de) itself constitutes a system of social values. Conspicuously displaying and rigidly clinging to "having virtue" (a kind of high-profile morality), and completely abandoning it, descending into "lacking virtue," together constitute the two poles of this system. Attachment to either pole—whether indulging in the empty fame of "having virtue" (the system rigidifies in the "Tightening State") or condoning the indulgence of "lacking virtue" (the system falls into disorder in the "Loosening State")—results in "lacking virtue" due to the loss of dynamic balance, i.e., a pathological state of the system. Both extremes are difficult to sustain in social practice.

"Superior virtue"—the most suitable and sustainable virtue needed by society—is precisely the system's "Equilibrium State" that transcends binary opposition and returns to nature: it does not deliberately pursue the form of "having virtue" (not tightening), nor does it fall into the abyss of "lacking virtue" (not loosening). Therefore, it can follow the laws of the "Dao" and achieve its eternal and vast virtue ("and thus it is virtue").

Thus, the "Tri-State Theory of the Dual Spiral Spring" not only reveals the physical laws governing the operation of heaven, earth, and all things but also provides a systematic and enlightening new perspective for understanding the deep structure and ideal state of "virtue" (de), a core concept in Chinese civilization.

3.1.2 A Systematic Interpretation from "The Ultimate Nothingness" to "The Myriad Things":

The core construction process of this model is a concrete and microcosmic formalized deduction of the cosmogony described in the Dao De Jing.

First, the establishment of the model vividly illustrates the initial program of "From the Ultimate Nothingness (Wuji) comes the Supreme Polarity (Taiji); from the Supreme Polarity come the Two Modes (Liang Yi)."

Whether it is processing a homogeneous piece of spring steel (the Ultimate Nothingness) into a "dual spiral spring" whole with specific functions (the Supreme Polarity), where the synchronously oscillating left and right spirals immediately present as the Two Modes of the system; or a fertilized egg, leaping from a state of chaotic potential (the Ultimate Nothingness) to an independent life system (the Supreme Polarity), where the material differentiation between the "germinal point"

and the ooplasm establishes the initial Two Modes—both clearly demonstrate the universal logic from "undifferentiated" to "whole established," and then to "internal differentiation."

Furthermore, the dynamic core of the model perfectly maps the complete generative picture of "The Dao begets the One; the One begets the Two; the Two beget the Three; the Three beget all things."

Within this framework:

- "The Dao": is the fundamental law inherent to the system (e.g., the genetic program of life, the law of physical interaction).
- "The One": is the independent system whole born according to "the Dao" (i.e., the Supreme Polarity, such as the dual-spiral structure, the fertilized egg individual).
- "The Two": are the two basic opposing polarities inevitably differentiated within the system (i.e., the Two Modes, such as the left and right spirals, the germinal point and the ooplasm).
- "The Three": are the three fundamental states—"Equilibrium," "Tightening," and "Loosening"—that inevitably emerge from the interaction of the two poles.
- "All Things": are all the complex phenomena presented by the cyclic evolution of these three fundamental states in different spatiotemporal scales and in infinite combinations.

Therefore, this study not only constructs a meta-model but also represents a modern deepening of the core philosophical thought of "the Dao." It indicates that "the Dao" can be understood as the inherent fundamental law of any self-organizing system; its mode of operation manifests as the dynamic cycle of the system's two poles among the "Three States"; and its value orientation is to realize and maintain the system's dynamic balance and sustainable evolution. Thus, "the Dao" transforms from an abstruse metaphysical concept into a system science principle that can be analyzed and observed, building a new bridge connecting classical wisdom and modern rational thinking.

3.2 Etymological Tracing: The Bipolar System View in the Original Form of the Character "Ji" (Pole)

This model takes the "two poles" as its core, and the original oracle bone and bronze script forms of the character " 极 " (jí, pole/ultimate) provide pictographic confirmation of this concept from the source of civilization (see Figure 3). The character form vividly depicts a person standing between heaven and earth: above is "heaven," below is "earth," these two constituting the two basic poles of the system; the person standing in the middle, connecting above and below, can be seen as the "linkage rod" that connects the two poles and transmits information.



This ancient wisdom of character creation indicates that the systemic view of "two poles coexisting and interacting through a middle medium" was a basic paradigm for ancient Chinese people to understand the world. The "Tri-State Theory of the Dual Spiral Spring" constructed in this article is precisely a modern scientific inheritance and philosophical deepening of this profound ancient systemic view.

3.3 Embodiment of Survival Wisdom: Following Heaven's Timeliness, Obtaining Earth's Benefits, and the Way of Kan Yu (FengShui) Balance

3.3.1 The "Heaven-Earth-Human" System and the Wisdom of Balance:

- Heaven (temporal rhythm) and Earth (spatial environment) constitute the "two poles" of the system;
- Humans and their dwellings (houses, cities) are the "linkage rods" situated between and influenced by the two poles.

The so-called "following heaven's timeliness" requires human behavior to resonate in sync with the dynamics of the "Heaven" pole (the cycle of seasons, climate change) — a concept also serving as the philosophical root of Traditional Chinese Medicine

theory. The so-called "obtaining earth's benefits" requires human dwellings to conform to the characteristics of the "Earth" pole (mountain-water patterns, hydrogeology), embedding themselves into the harmonious structure of the natural environment.

3.3.2 The Source of Kan Yu (FengShui): The Ancient Science of Finding and Constructing the "Equilibrium State"

The study of Kan Yu (FengShui) is the systematic practice of this wisdom. Its core goal is to find an "Equilibrium State" position for the human subsystem within the greater "Heaven-Earth" system—a position with minimal stress and harmonious energy flow. The various "sha" (malign influences) it seeks to avoid can be understood as points of concentrated stress within the system that cause "tightening"; its pursuit of "gathering wind and pooling qi" is to create a stable field where energy can circulate slowly and evenly — precisely the characteristics of an ideal "Equilibrium State" system.

The core principle of Kan Yu, "pure yang does not grow, isolated yin does not give birth," further reveals that a healthy, vital system must never cling stubbornly to one extreme. This principle and the "Tri-State Theory of the Dual Spiral Spring" mutually corroborate: a system that is continuously "tightened" without release, or completely "loosened" without the ability to tighten, are both "dead systems" that have lost the

capacity for dynamic response. True harmony (the Equilibrium State) lies in the smooth, reciprocal interaction and transformation of the forces of the two poles.

3.4 Summary

The laws revealed by the "Tri-State Theory of the Dual Spiral Spring" exist not only in abstract speculation but are also profoundly imprinted in the practical wisdom of ancient Chinese people. From the simple systemic view presented in the oracle bone script of "极" (a person standing between the two poles of heaven and earth), to the survival principles of "following heaven's timeliness and obtaining earth's benefits," and even the Kan Yu pursuit of the ideal state of "harmony between heaven and humanity," their core demand is the same: humans, as the "linkage rod" of the system, should, through active cognition and adaptation, achieve dynamic balance with the two poles of heaven and earth, thereby avoiding the risks of "tightening" and enjoying the benefits of "balance."

This fully demonstrates that the "Tri-State Theory of the Dual Spiral Spring" is not only a modern analytical tool but also a philosophy of action guiding our harmonious coexistence with nature and society, providing a philosophical framework with rich potential for future interdisciplinary integrated research.

Chapter 4: Epilogue: Dancing with the Ancients in the Galaxy of

Thought

Looking back at that Neolithic pottery bottle, what we have accomplished is not an archaeological verification, but a creative dialogue with the ancients. The Neolithic artisan may never have thought of quantum mechanics or international relations, but through profound observation and abstraction of nature (whirlpools, vines, snakes), they captured, with astonishing intuition, the universal "relational" paradigm in the cosmos.

The "Tri-State Theory of the Dual Spiral Spring," as a meta-model, derives its value not from what it is, but from what it can generate and explain. It invites us to examine the various rhythms—from microscopic particles to vast starfields, from inner emotions to the rise and fall of civilizations—with a unified perspective. It tells us:

True wisdom lies in understanding the eternal dance of all things between "tightening" and "loosening," and in finding that brief yet precious fulcrum of balance within this dynamic cycle.

This pottery bottle is therefore no longer just a container for holding wine; it holds a galaxy of thought. And this galaxy originated thousands of years ago, from a stroke of pale yellow pigment settled by an artisan's brush on an earth-toned pottery vessel.

As we look back on this intellectual journey—from the abstract motif on the ancient pottery, to the philosophical interpretation of quantum entanglement, to insights into the rhythms of social and natural systems — we ultimately find ourselves returning to the starting point of all existence: the atom. Within the atom, the "solidity" of the nucleus and the "void" of the electron cloud are connected by electromagnetic force, and their cycles of ground state, excitation, and radiation perfectly perform the microscopic dance of the "dual spiral spring" system among the "equilibrium," "tightening," and "loosening" states. This perhaps means that what we have revealed is not merely a thinking model, but possibly the most fundamental inscription of the "Dao" within the structure of reality. Thus, the seven-thousand-year-old motif and today's scientific image of the atom meet quietly in the galaxy of the "Tri-State Theory of the Dual Spiral Spring," together narrating the eternal story of opposition, connection, and dynamic balance.

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