

The Sentient Principle

Wu Jingyu

Email: jyw2004@126.com

2026

Abstract

This book proposes and systematically elaborates the "Sentient Principle," a novel paradigm for life sciences. The Sentient Principle traces back to Robert Whytt's (1751) insight into the essence of life, was deepened through Ivan Sechenov's theory of "Systemic Feelings," and achieves theoretical integration on the foundation of Gerald Edelman's Neural Darwinism.

The core thesis of the Sentient Principle is that the essence of life lies in the "Sensation-Behavior Loop." Sensation drives behavior, behavior changes sensation, and new sensation drives new behavior in continuous cycles. This loop comprises three core elements: (1) Value System Sensation, providing evaluative standards; (2) Anticipatory Sensation, gradually clarifying in the "Remembered Present"; (3) Sensation Discrepancy, the mismatch between immediate sensation and anticipatory sensation, driving learning and adaptation.

The book reveals the complete generative logic from innate to acquired, from biological to social and cognitive layers. Innate "Sensation-Behavior Closed Loops" gradually differentiate into refined acquired "Sensation-Behavior Loops" through Neural Darwinian selection mechanisms, guided by value system sensations. Social and cognitive "sentience" emerges from biological interactions through the unified mechanism of "Resonance-Evaluation-Consolidation."

The Sentient Principle systematically reconstructs core concepts in

traditional psychology and physiology: needs are dominant value system sensations, emotions are combinations of sensation discrepancy and anticipatory sensation clarity, memory is the consolidation of sensation-behavior traces, and consciousness is the continuous comparison between high-clarity anticipatory sensation and immediate sensation. All these concepts are projections of the "Sensation-Behavior Loop" from different perspectives.

This book not only provides a unified theoretical framework but also points toward a practical path: becoming a "Sentient Person"—a lucid self-observer, an active loop regulator, and a warm resonator of life. The Sentient Principle marks a fundamental shift in mind sciences from physics-imitating "cognitive science" toward life-embracing "life science."

Keywords: Sentient Principle; Sensation-Behavior Loop; Value System Sensation; Anticipatory Sensation; Sensation Discrepancy; Neural Darwinism; Remembered Present; Resonance-Evaluation-Consolidation

Contents

Introduction: A Paradigmatic Revolution (9)

Chapter One

Reflex Closed Loops and Systemic Feelings: The Innate Foundation
(13)

1.1 Meta-Sensation: The Three Basic Tensions (13)

1.2 Classification of Meta-Sensations and Innate Closed Loops (14)

1.3 Systemic Feelings: The Holistic Representation
of Life's Background (16)

1.4 The Essence of Meta-Sensation: Violation and Calibration
of Innate Value System Sensation (17)

1.5 Building Blocks of the World Model: Other Innate Sensation-
Behavior Closed Loops (21)

1.6 Closed Loops Rather Than Isolated Fragments: A Systemic View
of Innate Reflexes (22)

Chapter Two

**Sensation Differentiation and Behavior Selection: From Innate to
Acquired** (29)

2.1 Neural Foundation: Selective Generation (29)

2.2 Embodiment of Value System Sensation:
From Diffuse to Specific (33)

2.3 Generation of Anticipatory Sensation: Clarification Within
"The Remembered Present" (39)

2.4 Sensation Discrepancy: The Mechanism Driving Learning (44)

2.5 The Complete "Sensation-Behavior Loop":

From Sensation Discrepancy to Loop Closure (48)

2.6 Chapter Summary (52)

Chapter Three

Generation of the Social Stratum and Noetic Stratum (55)

3.1 The Birth of Social Sentience: Resonance and Expansion of
Shared Sensation (55)

3.2 Emergence of the Noetic Stratum: Internal Neural Activity as
Sensation Object (60)

3.3 Neural Foundation of Social Sensation-Behavior Resonance (66)

3.4 The Unified Logic of Generation: Organizational Principles of
Vital Resonance (68)

3.5 Dominant Dynamics and Background Tonality (70)

3.6 From Animals to Humans: Revolutionary Transformation
of Social Foundation (74)

Appendix One:

Reconstruction of Traditional Concepts (79)

Introduction: From Shadows to Entity (79)

I. Three Levels of Accessibility (80)

II. Reconstruction of Traditional Concepts (82)

III. Cultivating "Sentience" (95)

Conclusion: Return to Life's Self-Understanding (97)

Appendix Two:

Empirical Foundation and Philosophical Implications of the Sentient Principle (99)

Introduction: Exploration from Shadows to Entity (99)

I. Empirical Foundation of the Sentient Principle (99)

II. Reinterpretation of Traditional Experimental Paradigms (104)

III. Philosophical Implications of the Sentient Principle (105)

Conclusion: Let Science Embrace Life (109)

Appendix Three:

Sources of Thought (111)

Introduction: Stripping Away Appearances,

Returning to Essence (111)

I. Origins and Foundations of Thought (112)

II. Transcending Surface Opposition (117)

III. Deepening and Extension (121)

IV. Synthesis and Transcendence (127)

Conclusion: Thought's Inheritance and Innovation (131)

References (133)

Introduction: A Paradigmatic Revolution

In the long journey of exploring the mysteries of mind, we have been like artisans sketching shadows, meticulously measuring their shapes and recording their changes, yet placing our research focus excessively upon the shadows themselves. That grand shadow called "consciousness," with its ambiguity and philosophical burden, has long obstructed the concrete advancement of science. Now is the time to turn around and directly confront the entity casting the shadow—life itself, a living "sentient system."

This book aims to announce and construct an entirely new scientific paradigm: the Sentient Principle. Facing the impasse in which contemporary mind science is trapped within the ontological labyrinth of "what is consciousness," we advocate a fundamental shift in research strategy: no longer fixating on the whirlpool of philosophical speculation, but returning to the direct facts of life's sentience. This turn does not negate prior research, nor does it advocate merely accumulating more experimental data; rather, it provides a meta-theoretical framework for life sciences caught in the predicament of data abundance yet theoretical fragmentation—a framework capable of integrating existing knowledge and returning to the authentic sentience of life.

This core starting point is rooted in a profound intellectual lineage. It originates from the "Sentient Principle" proposed by Robert Whytt in the 18th century, was given concrete physiological content by Ivan Se-

chenov, and developed into "Systemic Feelings"—that internal, holistic sense of "bodily comfort or discomfort." Systemic Feelings reveal that mental activities are deeply rooted in the physiological processes maintaining life: signals such as hunger and thirst are the fundamental basis for driving behavior and sustaining survival. Our crucial advancement upon this foundation is that Systemic Feelings must include the "re-sensation" produced after the nervous system integrates and interprets internal and external signals, thereby constituting a fundamental "Sensation-Behavior Loop." Sensation drives activity (including both overt bodily behavior and covert neural activity), and the results of activity (whether changing the external environment or forming new internal neural connections) generate new sensations through the "Reentry" mechanism, cycling endlessly. This is precisely the embodiment of Gerald Edelman's "The Remembered Present" at the theoretical construction level—integrating traces from the history of thought into present creation, generating a novel and unified explanatory landscape.

The core insight of the Sentient Principle is this: life is a perpetually operating "Sensation-Behavior Loop" system. This system is sustained by Three Basic Tensions: Defensive (boundary integrity), Aggressive (energy balance), and Empathy (rhythmic continuation), with the priority hierarchy Defensive > Aggressive > Empathy, reflecting the differences in urgency of survival threats and manifesting as the asymmetry of negative > positive in value evaluation. Life carries the Innate Value System Sensation bestowed by evolution (a diffuse value baseline),

forms Acquired Value System Sensation through accumulated experience, and gradually clarifies into concrete Anticipatory Sensation within "The Remembered Present." When Immediate Sensation conflicts with Anticipatory Sensation, Sensation Discrepancy arises, driving the initiation of the loop and becoming the ultimate engine of learning, adaptation, and growth. The dynamic essence of the entire system is "flow" and "change": all tensions and values are like continuously coexisting undercurrents, their intensities constantly fluctuating and interweaving in transformation.

Upon the foundation of the Three Basic Tensions, the sentient system, through iterative cycles and increasing complexity, gives rise to three interpenetrating evolutionary strata, forming the "Three Layers, Nine Categories" structure: the Vital Stratum (safety/territory, nutrition/resources, sexuality/reproduction), the Social Stratum (group belonging, hierarchical status, altruistic attachment), and the Noetic Stratum (exploration, play, religious cognition), all permeated by the three-dimensional dynamics of Defensive, Aggressive, and Empathy. They are not static, fragmented units, but a spiraling generative process, differing only in the real-time concentration ratios of the three-dimensional dynamics within the flow of life.

To systematically unfold this framework, the three core chapters of this book will respectively elaborate: the foundation from innate reflex closed loops to Systemic Feelings; the refined differentiation and selection from sensation to behavior; and the generation of the Social Stratum

and Noetic Stratum from vital interactions. Three appendices will provide support from conceptual reconstruction, empirical implications, and intellectual genealogy, jointly constructing the theoretical edifice of the Sentient Principle.

The endpoint of this journey is to refocus the light of science upon that warm, brilliant, and ever self-constructing entity—living life itself. The Sentient Principle is born precisely for this purpose.

Chapter One

Reflex Closed Loops and Systemic Feelings: The Innate Foundation

The grand edifice of mind does not stand upon a void, but is rooted in the most primal and fundamental sensation-reality of the living organism. Before we turn our gaze to the turbulence of emotion or the nascent shadows of consciousness, we must first return to the wellspring of all experience—those deep forces that drive and sustain life's continuation. This chapter will explore the origins of these forces, what we call the vital basic tensions of "Meta-Sensation," and elucidate how they constitute the "prime mover" for the birth of the mental universe through innate closed loops.

1.1 Meta-Sensation: The Three Basic Tensions

Living systems maintain their existence through three basic tensions:

Defensive Tension (boundary integrity): An alarm against invasion, injury, and disintegration, driving behaviors to eliminate threats. Its Meta-Sensations include pain, nausea, and suffocation.

Aggressive Tension (energy balance): A craving for what is lacking, deficient, or depleted, driving behaviors to acquire resources. Its Meta-Sensations include hunger, thirst, and fatigue.

Empathic Tension (rhythmic continuation): A tendency toward cyclicity, fusion, and renewal, driving temporal integration and repro-

ductive behaviors. Its Meta-Sensations include drowsiness, sexual desire, and the urge to excrete.

These Three Basic Tensions constitute the fundamental dimensions of vital dynamics. They are not isolated sensation-points, but diffuse, primordial modes through which life interacts with the world. All internal states and external behaviors of the living organism can find their initial vectors within this dynamic force field.

These Three Basic Tensions possess a clear priority hierarchy: Defensive > Aggressive > Empathic. This ordering stems from differences in the urgency of various threats to life's continuation: boundary destruction immediately terminates life; energy depletion leads to life's rapid cessation; while rhythmic dysregulation, though damaging to health, allows life to persist for a considerable duration. Thus, evolution has shaped this deep ordering of priorities.

This is manifested in the value-evaluation mechanism as: negative value evaluation > positive value evaluation. In the struggle for survival, avoiding danger is more important than obtaining reward; forgetting a success costs one opportunity, but forgetting a danger may cost one's life. This asymmetry pervades all levels of life and is a profound imprint of survival wisdom.

1.2 Classification of Meta-Sensations and Innate Closed Loops

Based on the Three Basic Tensions, we can systematically classify

the major Meta-Sensations and reveal their innate, goal-directed Behavior closed loops.

Defensive Meta-Sensations

Pain: A powerful alarm of tissue damage, driving withdrawal and protective behaviors. When noxious stimuli activate pain receptors, the flexion reflex at the spinal level immediately initiates, causing the limb to rapidly withdraw from the harm source. Loop Closure of this closed loop is not merely the cessation of movement, but the successful regulation of Systemic Feelings—the pain signal is removed, and Defensive Tension declines.

Nausea: An alarm of toxin ingestion or visceral dysfunction, driving expulsion behavior. The vomiting reflex forcefully contracts the abdominal muscles and diaphragm, expelling gastric contents to eliminate the threat.

Suffocation: An extreme alarm of blood oxygen insufficiency, driving clearance and deep inhalation behaviors. Coughing reflexes and struggling behaviors all aim to restore airway patency and ensure oxygen supply.

Aggressive Meta-Sensations

Hunger: A signal of declining blood glucose and gastric emptying, driving foraging and feeding behaviors. The rooting reflex (head turning toward tactile cheek stimulation) and sucking reflex in newborns constitute the most primitive energy-acquisition closed loop.

Thirst: A signal of elevated extracellular fluid osmotic pressure, driving water-seeking and drinking behaviors.

Fatigue: A signal of ATP depletion and metabolic waste accumulation, driving rest and sleep behaviors.

Empathic Meta-Sensations

Drowsiness: A signal of circadian rhythm and sleep pressure, driving sleep-onset behavior.

Sexual desire: A signal of periodic changes in sex hormone levels, driving courtship and mating behaviors.

Urge to excrete: A signal of bladder or rectal filling reaching threshold, driving excretory behavior.

These closed loops are neural circuits pre-installed by evolution in living systems, the most direct and robust connections between sensation and action. They ensure that at the most fundamental level, life can mount irresistible responses to maintain its own existence.

1.3 Systemic Feelings: The Holistic Representation of Life's Background

Beyond the specific Meta-Sensations, what Sechenov described as that "indifferent, overall sensation"—that sense of "bodily comfort" or "bodily discomfort"—is precisely the holistic background of system state formed through the integration of all the aforementioned Meta-Sensation tensions.

It is not an independent sensation, but the overall flux of all Meta-

Sensations in dynamic balance or imbalance. When discomfort tensions such as hunger, pain, and fatigue are at low intensity, while sensations of satisfaction and comfort dominate, the system presents a background of "comfort," allowing vital energy to flow freely; conversely, when multiple discomfort tensions intensify and persist, the system background shifts to "discomfort," compelling the individual to undertake more fundamental adjustive behaviors.

This background sensation is a dynamic intensity field: all Meta-Sensation tensions persist continuously, differing only in whether their intensity is "high" or "low." "Comfort" means all tensions are within acceptable ranges; "discomfort" means certain tensions have exceeded thresholds.

This is the sentient system's overall assessment of its own existential state. It constitutes a dynamic intensity field, becoming the deep seabed from which all specific tensions within the system can emerge as "dominant" or recede into the "background."

1.4 The Essence of Meta-Sensation: Violation and Calibration of Innate Value System Sensation

Meta-Sensations such as pain, hunger, and nausea are commonly understood as simple signals of homeostatic imbalance. However, viewed from the deep dynamic structure of the sentient system, they reveal a more fundamental principle: all "discomfort" originates from "Sensation Discrepancy." To understand this point, we must first intro-

duce the foundational concept of "Innate Value System Sensation."

Innate Value System Sensation: The Value Baseline Bestowed by Evolution

Before an individual life begins its experiential journey, its system is not a blank slate. Shaped by hundreds of millions of years of evolution, the living organism innately carries a set of internal value baselines regarding its "ought-to-be state," profoundly inscribed in its genes. This set of baselines does not consist of concrete images or explicit expectations, but rather a diffuse, value-laden tension-balance standard, constituting the living system's "Innate Value System Sensation."

It is primarily manifested in:

Homeostatic parameter value baselines: The ideal balance points and acceptable fluctuation ranges for body temperature, blood pressure, blood glucose concentration, body fluid osmotic pressure, etc., are evolution's preset "value standards."

"Value gravitational centers" of the Three Basic Tensions' balance: The optimal synergistic state of the three fundamental dynamics—Defensive (boundary integrity), Aggressive (energy balance), and Empathic (rhythmic continuation)—constitutes the deep value orientation for the system's operation.

Value propensity toward regularity and causality: The nervous system innately tends to seek patterns and regularities from sensory input, instinctively becoming alert to completely random noise or events

violating the normal physical order. This is a value-laden propensity, not a specific expectation.

Innate Value System Sensation is not "expectation" but "value baseline": it is not an expectation of "what will be," but a basis for value judgment about "what ought to be," not a goal for action.

This Innate Value System Sensation is the condensation at the genetic level of the "successful experience" refined by the species in the competition for survival, providing each newborn life with initial self-guidance for survival.

Meta-Sensation as "Sensation Discrepancy"

When the living organism's immediate state deviates from the aforementioned evolution-preset value baseline, the Immediate Sensation and Innate Value System Sensation produce a fundamental conflict.

Pain: Immediate Sensation (tissue damage) severely violates the innate Defensive value baseline ("tissue ought to be intact").

Hunger: Immediate Sensation (declining blood glucose, energy deficiency) persistently violates the innate Aggressive value baseline ("blood glucose ought to be within the normal range").

Sleep deprivation sensation: Immediate Sensation (prolonged wakefulness, drowsiness) persistently violates the innate Empathic (rhythmic continuation) value baseline ("one ought to rest according to rhythm").

Thus, the innate "discomfort" signified by Meta-Sensation is, in es-

sence, the most primitive and intense "Sensation Discrepancy" triggered when immediate physiological sensation seriously mismatches with "Innate Value System Sensation."

At this stage, the system has not yet formed explicit "Anticipatory Sensation" (such as "I should go find food"). Sensation Discrepancy is merely an indifferent sense of discomfort, driving the system to initiate behavioral exploration. Anticipatory Sensation gradually clarifies during the process of behavioral exploration, based on "Sensation-Behavior Trace," through "The Remembered Present."

Meta-Sensation does not exist in an either-or manner, but rather always exists at varying intensities: mild hunger means the intensity of the Aggressive-energy balance Value System Sensation has slightly risen; strong hunger means the intensity has risen substantially, becoming dominant; extreme hunger means the intensity overwhelms all other tensions.

This perspective anchors the principle of "Sensation Discrepancy" at life's most fundamental level: from the very beginning of its existence, life is a system carrying value baselines; its most fundamental "discomfort" stems from deviation from the value baselines bestowed by evolution. This establishes a unified logical foundation for understanding all acquired complex discomforts.

1.5 Building Blocks of the World Model: Other Innate Sensation-Behavior Closed Loops

Beyond Meta-Sensations directly serving homeostasis, the living organism also has pre-installed a series of crucial innate sensation-behavior mechanisms for constructing a preliminarily stable, operable world model, providing the stage for more complex interactions.

Visual orientation and tracking: Innate sensitivity to moving objects in the visual field, driving the eyes to automatically follow moving objects (such as the mother's face). This locks onto and identifies potential targets (prey, companions, or threats) in the environment and is the visual foundation for exploratory behavior.

Novelty orienting reflex: Curious alertness to sudden, novel, or uncertain stimuli, driving sudden head-turning, pupil dilation, sensory orientation toward the stimulus source, and suspension of bodily activity. This is an exploratory defensive response, pausing current activity to assess the potential significance of the new stimulus (threat or opportunity?), and is the starting point for Learning and adaptation.

Chemical sensation and instinctive approach-avoidance: Innate likes and dislikes for specific odors, driving aversion to putrid smells (frowning, turning away) or preference for sweetness and milk fragrance (sucking, approaching). This is an innate environmental value label, directly guiding the pursuit of benefit and avoidance of harm, serving as the chemical outpost for safety/territorial defense and nutrition/resource acquisition.

Proprioception and postural adjustment: Direct sensation of limb position, muscle tension, and body balance, driving sucking reflex, grasping reflex, stepping reflex, and balance adjustment. This constructs the body schema, maintains effective behavioral posture, and is the spatial foundation for all purposeful action.

These innate closed loops, together with Meta-Sensations, jointly construct internally coordinated safeguard mechanisms for the living organism's initial survival and provide a foundational guiding framework for its interaction with the environment. They constitute the indispensable underlying scaffolding for all subsequent experiential Learning, social interaction, and cognitive leaps. Upon them, the grand edifice of "Sentient" can begin its splendid construction.

1.6 Closed Loops Rather Than Isolated Fragments: A Systemic View of Innate Reflexes

In traditional physiology textbooks, "Reflex" is often depicted as an isolated causal fragment: a stimulus necessarily elicits a fixed response. While this "stimulus-response" fragmented model is simple, it inadvertently severs the integrity of vital activity, reducing the living, continuous flow of life into a string of isolated neural events. We will abandon this perspective that fragments vital activity, replacing it with a "closed loop" systemic view. All innate Reflexes are, in essence, the most compact and robust links within the fundamental life cycle of "Sensation-Behavior"; they are the intrinsic adaptive wisdom maintaining system stability and

responding to external challenges.

Redefining "Reflex": Miniature Closed Loops Serving Homeostasis

From the perspective of the sentient system, an innate Reflex is by no means a one-time neural event, but a miniature, pre-installed "Sensation-Behavior-Sensation" closed loop. Its fundamental purpose is to serve homeostatic maintenance at the fastest speed, a pre-installed adaptive response mechanism for the system to address specific challenges.

Take the flexion reflex (such as rapidly withdrawing the hand from a hot object) as an example: A noxious stimulus (high temperature) activates pain receptors, producing the Meta-Sensation of "pain" (Defensive Tension surges sharply); the signal enters the spinal cord and is integrated through very few synapses; motor neurons discharge signals, causing flexor contraction and extensor relaxation, completing the hand-withdrawal action; the hand leaves the heat source, the pain sensory input is removed, and Defensive Tension declines; the limb is preserved, the threat to homeostasis is eliminated, and the conflict between Immediate Sensation and Innate Value System Sensation (Sensation Discrepancy) is resolved.

Thus, the endpoint of a Reflex is not the cessation of action, but the successful regulation of Systemic Feelings. This closed loop is a successful act of homeostatic service. If the Reflex fails to eliminate the threat (e.g., the limb fails to move away successfully), the pain signal

will continue to input, Defensive Tension will remain persistently elevated, the system will sense that Loop Closure has not occurred, and it may trigger more intense Behavior (such as whole-body rolling and struggling) or escalate to a sentient experience of suffering.

Functional Classification of Reflex Closed Loops

According to their complexity and function, the major innate reflex closed loops can be classified into three categories within the sentient three-dimensional dynamic structure:

Defensive protection: Flexion reflex, corneal reflex, sneeze reflex; core sensations are pain and foreign body sensation; behavioral outputs are withdrawal, eye closure, and expulsion, serving boundary integrity.

Nutritive acquisition: Sucking reflex, swallowing reflex, rooting reflex (head turning toward cheek stimulation); core sensations are hunger and oral tactile sensation; behavioral outputs are sucking, swallowing, and head-turning search, serving energy balance.

Rhythmic and developmental: Grasping reflex, stepping reflex, Moro reflex (startle reflex); core sensations are proprioception and loss-of-balance sensation; behavioral outputs are grasping, alternating stepping, embracing actions, serving body schema construction and caregiver bonding.

Environmental exploration and orientation: Orienting reflex (head turning toward light/sound), eye tracking; core sensations are novelty sensation and audiovisual sensation; behavioral outputs are sensory

orientation and target locking, serving environmental model construction and opportunity/threat identification. This category represents an extension of Defensive protection—proactive environmental scanning to anticipate threats and opportunities—and thus belongs within the Defensive category.

This classification indicates that Reflexes are not chaotic; they systematically cover the domains of the Three Basic Tensions defined by Meta-Sensation, are innate behavioral patterns refined by the sentient system through evolution, and lay the foundation for individual survival and development.

Dynamic Characteristics of Reflex Closed Loops

These pre-installed closed loops are not rigidly fixed; their operation exhibits intrinsic dynamic characteristics:

Threshold: The minimum stimulus intensity required to trigger a Reflex. The threshold is adjustable; for example, in a state of high alertness, the threshold for Defensive Reflexes is lowered, making them easier to trigger. Essentially: the threshold of tension intensity required to trigger the Reflex.

Intensity and gain: The relationship between the amplitude of the reflex response and stimulus intensity. Strong pain elicits vigorous withdrawal. Essentially: the higher the tension intensity, the stronger the behavioral output.

Adaptation: Under sustained, harmless stimulation, some Reflexes

weaken (e.g., adaptation to persistent mild touch). This avoids needless depletion of system resources. Essentially: natural attenuation of tension intensity.

Closed loop competition and integration: When multiple reflex closed loops are simultaneously activated, the system integrates them according to their biological priority "value ranking." For example, maintaining body balance may temporarily suppress an inconsequential scratching reflex. Essentially: competition among different tensions, with the tension of highest intensity gaining dominance.

From Isolated Closed Loops to Systemic Symphony: Integration of Multiple Reflexes

In real-life situations, isolated reflex closed loops are rare. A stimulus often triggers multiple closed loops simultaneously or sequentially, which interweave to form a coordinated systemic symphony.

Take "aspiration of a foreign object" as an example: The foreign object contacts the laryngeal mucosa, first triggering the Defensive cough reflex (attempting forceful expulsion), with Defensive Tension intensity surging sharply; simultaneously, the sensation of suffocation (Defensive Meta-Sensation) rises acutely, triggering panic and struggling Behavior (whole-body Defensive Reflex), with Defensive Tension intensity reaching an extremely high level, overwhelming all other tensions; the face may flush due to hypoxia, which is a physiological regulatory reflex, with Aggressive Tension (energy balance) also rising; if success-

fully coughed out, all Reflexes subside, Systemic Feelings return from extreme "discomfort" to "comfort," and all tensions fall back to normal ranges; if unsuccessful, the system will mobilize all available resources, with Defensive Tension intensity remaining persistently at extremely high levels until Loop Closure occurs or the system collapses.

This example demonstrates that Reflexes are the sentient system's repository of real-time, instinctive behavioral strategies. They constitute the lowest, fastest execution layer of Behavior and provide a stable platform and raw material for more complex experiential Behavior and sentient decision-making above them.

* * *

This chapter has established the innate foundation of the sentient system at three levels: at the Meta-Sensation level, it reveals the Three Basic Tensions and their priority; at the Innate Value System Sensation level, it elucidates the value baseline bestowed by evolution; at the innate reflex closed loop level, it displays the most compact and robust "Sensation-Behavior" Loop. The core insight pervading this chapter is: all tensions and Value System Sensations jointly constitute the indivisible, continuously surging background of life experience. Their mode of existence is not mutually isolated or alternating, but as a flow of sensation that is always co-present and intertwined. The distinction lies entirely in the eternal flux of intensity contrasts among different dimensions within this flow of sensation.

This innate foundation provides a solid platform for the unfolding of the next chapter. In Chapter Two, we will see: how Innate Value System Sensation becomes embodied through experience into Acquired Value System Sensation, how innate reflex closed loops are refined through Learning into complex behavioral patterns, and how Anticipatory Sensation gradually clarifies within "The Remembered Present."

Chapter Two

Sensation Differentiation and Behavior Selection: From Innate to Acquired

Upon the stable substrate provided by innate Reflexes, the sentient system begins its developmental journey. The essence of this process is not random construction upon a blank slate, but rather an adaptive generative process in which the entire "Sensation-Behavior" Closed Loop, under the evaluation of primordial Value System Sensation (rooted in innate value baselines) and driven by "Sensation Discrepancy," progresses from crude and inefficient toward precise and efficient functioning.

This chapter will reveal how that diffuse "good" or "bad" Value System Sensation guides the system in acquired experience to select and differentiate specific patterns of precise environmental interaction, and in this process construct complex networks of Acquired Value System Sensation and clarified Anticipatory Sensation.

2.1 Neural Foundation: Selective Generation

Dynamic Competition of Whole-Brain Functional Ensembles

The neural correlate of the dominant sentient state at any moment is a specific activity pattern of a whole-brain functional ensemble. This ensemble is a temporary functional unity emerging through dense interactions between the thalamo-cortical system and key subcortical structures

(such as the basal ganglia, amygdala, and basal forebrain).

The composition of this ensemble exists in perpetual flux. Within hundreds of milliseconds, a group of neurons forms a functional unity through intense synchronized firing, allowing different sentient states to manifest. The formation of ensembles is essentially the result of competition and cooperation among different functional subsystems within the brain: the activity intensity of various neuronal groups is constantly changing; when an ensemble's activity breaks through a threshold it becomes dominant and suppresses the activity of other ensembles; simultaneously, the dominant ensemble needs to recruit cooperation from other ensembles, achieving cross-regional sensory integration through synchronized firing.

Value System Sensation modulates this process of competition and cooperation through diffuse neuromodulatory systems. Positive value evaluation (such as dopamine) selectively enhances the excitability of relevant neuronal groups; negative value evaluation (such as norepinephrine) may selectively suppress certain activity patterns or alter the gain of signal integration. The ultimate result of modulation determines which neural activity pattern can gain current "dominance."

Therefore, a "whole-brain functional ensemble" selectively consolidated through "Value System Sensation" evaluation is the first functional "circle" formed by the sentient system at the most microscopic scale. It signifies that an effective "Sensation-Behavior" pattern has emerged from chaos and stabilized through neural-level "Resonance" and value-

laden "positive value evaluation."

Reentry as the Neural Scaffold for Closed Loop Optimization

The dynamic integration of "whole-brain functional ensembles" is rooted in large-scale signal circulation within the brain—namely "Reentry"—which itself is the bidirectionally interactive neural signal flow constituting the "Sensation-Behavior Loop." It includes classical ascending sensory conduction, descending modulation, and parallel, continuous dialogue among various brain regions.

This massive signal circulation network is the structural scaffold enabling "Sensation-Behavior Closed Loops" to be realized at the neural level. It achieves sensory integration: through the cyclical back-and-forth of sensory signals among brain regions at different hierarchical levels, local features are integrated into a meaningful unified field of Systemic Feelings. It supports behavioral generation: the process of motor neural signal discharge is itself the result of cyclical integration among the premotor area, basal ganglia, and cortex of Immediate Sensation, re-sensation of past Sensation-Behavior Traces, and Systemic Feelings of the organism's internal state. It ensures Loop Closure: new sensations produced by Behavior enter the cycle as new inputs and are compared with the sensation the system has generated, based on past cycles, regarding future reality. When the two mismatch, this "Sensation Discrepancy" becomes a powerful, new Systemic Feeling, driving the sys-

tem's Learning and behavioral adjustment.

Thus, the entire activity of the sentient system is built upon this perpetually operating, multidimensional neural signal circulation. It is the physiological realization within the brain of the "Sensation-Behavior closed cycle."

Hebbian Plasticity: Trace Consolidation Tuned by Value System Sensation

Hebb's law describes the basic phenomenon of activity-dependent neural connectivity: "neurons that fire together, wire together." Within the sentient framework, we understand this as: co-activated neuronal ensembles tend to form a functional unity, but whether this unity's connections can be consolidated ultimately depends on whether its activity results are judged by the life's Value System Sensation as "fitting."

When a Sensation-Behavior Closed Loop is operating, a specific, distributed neural functional ensemble is synergistically recruited and activated, with the ensemble's activity pattern specifically corresponding to that closed loop's operation. At this time, if the closed loop's result (such as alleviating hunger or thirst, successfully avoiding danger) elicits a positive, diffuse evaluative sensation (enhancement of the corresponding Value System Sensation), then this "good" sensation arising from life's depths acts like a chemical messenger, "empowering" this moment's neural co-activation, making the trace it leaves especially deep and lasting. Conversely, without this Value System Sensation's empow-

erment, the trace rapidly fades.

This is not "creating" new connections, but adaptively adjusting the strength of existing connections. All possible neural connections exist at some baseline strength; Value System Sensation's empowerment determines which connections are significantly strengthened and which are allowed to decay.

Therefore, Hebbian phenomena represent the nervous system's potential capacity to realize co-activation, while Value System Sensation is the ultimate arbiter bestowing biological meaning and determining which traces endure.

2.2 Embodiment of Value System Sensation: From Diffuse to Specific

Evaluative Sensation: Dynamic Adjustment of Value System Sensation

The diffuse value modulation system in the brain, through its very activity, constitutes a continuous internal evaluation—a Systemic Feeling regarding "value." This evaluative sensation is not static, but dynamically adjusts Value System Sensation itself as its foundation.

The dopamine system's response to positive mismatch between Immediate Sensation and Anticipatory Sensation embodies the system's production of positive evaluation for this mismatch situation, constituting the neural basis for Acquired Value System Sensation formation. The norepinephrine system's response to "uncertainty" produces an alert Val-

ue System Sensation of "environmental information ambiguity," forming the rudiment of negative Value System Sensation. The release of neuro-modulators is the internal Behavior driven by this evaluative sensation, aimed at broadly modulating brain region excitability.

Crucially, evaluative sensation's effect is recursive: it not only evaluates the results of "Sensation-Behavior Loops," but also reshapes the value system by adjusting the "afferent connections" of Value System Sensation itself. This is a self-referential process: Value System Sensation evaluates the results of behavioral closed loops, and this evaluation in turn adjusts Value System Sensation's future state. Through this recursive adjustment, Acquired Value System Sensation gradually differentiates and clarifies upon its innate baseline.

From Innate to Acquired: The Embodiment Process of Value System Sensation

Upon the substrate of innate Reflexes, the sentient system begins its developmental course. Its essence is that the entire "Sensation-Behavior" Closed Loop, as a functional unit, under the evaluative drive of primordial Value System Sensation, undergoes adaptive selection from chaotic inefficiency toward orderly efficiency. The system initially exists in a generalized preparatory state, with various potential Sensation-Behavior Loops co-existing in weak intensity form.

The evaluation by Value System Sensation transforms itself—this is precisely Edelman's core insight that "value itself is adaptive": value is

plastic, not fixed. Standards of "good" and "bad" continuously flux through experience.

When a closed loop's operational result accords with innate value orientation, positive value evaluation is triggered. This diffuse "good" sensation, through its broad projection, non-specifically strengthens connections among the neuronal ensembles synchronously active at that moment. This is precisely the manifestation of "value-dependent selection": that specific Sensation-Behavior Loop which happens to lead to positive efficacy has its neural connection strength selectively elevated. All possible closed loops exist; positive evaluation elevates successful closed loops' connection strength, transforming them from "weak connections" to "strong connections," making them more easily activated in similar contexts.

For example, when an infant's accidental sucking action obtains milk, the conflict between Immediate Sensation and Innate Value System Sensation is resolved, and the system produces positive evaluation. The connection strength of the "seeking-sucking" closed loop is thereby elevated, and the Acquired Value System Sensation "sucking is good" is formed. Innate Value System Sensation, through selecting successful specific closed loops, achieves its first "embodiment."

The wisdom of the value system is equally manifested in firmly remembering danger. When a closed loop's operational result seriously violates innate value orientation, intense negative value evaluation is triggered. This "extremely bad" sensation likewise strengthens synchro-

nously active neural connections, but its significance lies in marking the Sensation-Behavior Trace leading to failure as "dangerous." What the system remembers is "to avoid this loop."

This change is diffuse and generalized, affecting entire situational categories. This is likewise "value-dependent selection," but in the negative direction: all possible loops exist; negative evaluation elevates the "danger-marking intensity" of dangerous loops, transforming them from neutral to highly dangerous, such that they will be actively suppressed in similar contexts.

Positive and negative value evaluations exhibit crucial asymmetry in their consolidation mechanisms. Positive consolidation typically requires multiple repetitions, forming "worth-pursuing" behavioral patterns, with Acquired Value System Sensation elevating relatively slowly. Negative consolidation often becomes profound after just once, forming "must-avoid" behavioral patterns, with Acquired Value System Sensation elevating extremely rapidly. Its evolutionary logic lies in: in survival competition, forgetting danger once is far more fatal than forgetting success once. This is also the manifestation of Defensive priority in the Learning mechanism. This asymmetry is also reflected in neural mechanisms: positive value evaluation's consolidation often relies on precise, brief "pulse"-type signals to reinforce successful traces; whereas negative value evaluation's consolidation more resembles a sustained, diffuse deepening of "background negative potential," thereby marking dangerous traces profoundly and durably.

Through this bidirectional value evaluation mechanism, diffuse Innate Value System Sensation gradually "embodies" into concrete, contextualized networks of Acquired Value System Sensation. Acquired Value System Sensation is the refined differentiation and predictor of innate value baselines; they predict which "Sensation-Behavior Loops" will satisfy deep value needs.

Value Extension and Differentiation: Constructing Goal Hierarchies Through Closed Loop Sequences

The fundamental mechanism for constructing Acquired Value System Sensation networks is value-dependent selection. Not all "Sensation-Behavior Loops" are equally consolidated; rather, those loops capable of predicting or leading to innate value satisfaction are value-dependently selected and strengthened. Value System Sensation (through neuromodulators) regulates changes in synaptic strength; successful loops are strengthened, dangerous loops are marked.

"Acquiring value" encompasses two levels: ontologically, forming "this closed loop is good/dangerous" Acquired Value System Sensation from non-existence to existence; dynamically, the initiation sensation of this closed loop itself triggers changes in Value System Sensation intensity. For example, an infant's value acquisition process for "baby bottle" is the result of repeated selective strengthening of the "see bottle → suck → obtain milk" loop. Ultimately, the sensation of "seeing the bottle" itself can drive approach Behavior.

At this point, the sensation of "value rising" becomes a new internal "goal-like sensation"—the system directly senses that realization of this loop will bring satisfaction or danger. Positive Goals drive approach Behavior; negative Goals (anti-goals) drive avoidance Behavior.

To achieve Goals, the system needs to develop more anterior instrumental closed loops. The recursion of value-dependent selection enables value to be transmitted: an originally neutral cue (such as a sound), because it can reliably predict an already-valued stimulus (such as a baby bottle or flame), itself has its connection with the value system selectively strengthened, thereby acquiring value. The originally diffuse Value System Sensation is transmitted and differentiated backward like a relay through a series of selectively consolidated closed loop sequences, each step embodying it in more concrete and refined Sensation-Behavior patterns. This is precisely the core mechanism of "acquired value" transmission in Edelman's theory.

Through this bidirectional value transmission mechanism, complex networks of Acquired Value System Sensation are generated. They are the experiential "strategy repository" for realizing deep innate value baselines. In actual situations, the system simultaneously faces multiple positive and negative Goals; Behavior's final selection depends on the value tension contrast among these Goals within the current sensation field. This dynamic balance is the foundation of the sentient system's flexible adaptation.

With experiential accumulation, the value network becomes in-

creasingly complex and hierarchical, from the Vital Stratum, through the Social Stratum, to the Noetic Stratum. Value System Sensations at all levels are interwoven within the overall sensation field of life, with higher-level Value System Sensations gradually growing and clarifying from foundational-level sensation patterns.

2.3 Generation of Anticipatory Sensation: Clarification Within "The Remembered Present"

Trace Sensation: Re-sensation of Past "Sensation-Behavior Traces"

Memory is not the static storage of information, but rather the activity traces left upon neural structures by past "Sensation-Behavior" Loops. Recall, likewise, is not the simple replay of these traces, but the system's creative "re-sensation" of past sensory experience based upon these traces. Each recall is a reconstruction based on the trace's skeletal framework, infused with the flesh of the current state. Thus, the same Memory, when "re-sensed" at different moments, will exhibit different Value System Sensations. This "re-sensation of traces," through continuous interaction and integration with immediate sensory input, jointly generates the unique, current sentient field. We never live in the "pure present"—every vivid present moment is generated within "The Remembered Present," through the continuous convergence and mutual modulation of past (re-sensation of traces), present (Immediate Sensation), and future (Anticipatory Sensation).

Anticipatory Sensation and Its Flux

Anticipatory Sensation is, within "The Remembered Present," based on the re-sensation of past "Sensation-Behavior Traces," an embodied, directly sensible anticipation of imminent reality. It is not an abstract computation or model, but a value-imbued, context-dependent sensory orientation. When we say "I feel there should be an apple there," what drives us is not cold logical inference, but a warm sensation carrying concrete expectation. This differs essentially from traditional cognitive science's view of prediction as decontextualized information processing: it is not "the brain computing what the world will be like," but "life sensing what the world ought to be like." This "ought" simultaneously encompasses factual prediction and value expectation.

The generation of Anticipatory Sensation is a continuous evolutionary process from vague to clear. Its most diffuse form is essentially the diffuse Value System Sensation itself. For example, when tension appears in the energy balance value baseline, what the system initially produces is merely a vague sense of imbalance that "something ought to be supplemented," lacking clear direction and concrete solutions. As "The Remembered Present" unfolds, relevant past traces are "re-sensed" and integrated with Immediate Sensation. Acquired Value System Sensation (such as "food is good") begins to intervene, and the expectation thereby gains preliminary directionality, such as "going to the kitchen might find food." At this point, Anticipatory Sensation moves from purely diffuse Value System Sensation toward semi-clarity.

As integration deepens, the expectation becomes clear and specific, such as "there are apples in the refrigerator." It not only specifies the nature of the problem but also indicates the embodied location of the solution. When clarity reaches its peak, Anticipatory Sensation transforms into explicit goal-like sensation, containing both clear expectation and definite action intention, directly driving specific Behavior such as "walking to the refrigerator." A key insight is: Value System Sensation is the starting point (the most diffuse end) of Anticipatory Sensation's generative process. This means that all Sensation Discrepancy can essentially be understood as "mismatch between Immediate Sensation and some form of Anticipatory Sensation." Whether Initiating or Verifying Discrepancy, both are unified within this framework.

This clarification process is neither linear nor completed in one stroke, but dynamic and iterative. In each "Remembered Present," Anticipatory Sensation continuously fluxes: it may progress from vague to clear, or may regress from clear back to vague when expectations fall through. This is precisely the process by which life explores direction through sensation and seeks certainty within uncertainty.

The dynamic flux of Anticipatory Sensation is rooted in two sources: the flux of past "Sensation-Behavior Traces" and the flux of Immediate Sensation.

First, past traces themselves are not fixed. Which traces are "re-sensed," their relative intensities, and how they are combined all continuously change with the system's overall state. For example, Sensation-

Behavior Traces related to current value tensions emerge from the background to dominate expectation formation; when that tension is relieved, these traces recede to the background.

Second, Immediate Sensation is always in flux. This flux may stem from gradual internal state changes (such as slow accumulation of hunger driving expectation to clarify from "discomfort" to "need food"), from sudden environmental changes (such as unexpectedly discovering a banana en route, instantly altering the expectation of "finding apples"), or from internal cognitive leaps (such as a flash of inspiration transforming expectation from "confusion" to "clarity").

These two types of flux deeply interweave and mutually modulate within "The Remembered Present," jointly shaping the flux of Anticipatory Sensation. The flux of Sensation-Behavior Traces provides expectation's possible content and direction; the flux of Immediate Sensation modulates expectation's intensity and urgency. Their interwoven interaction enables Anticipatory Sensation to progress from generalized to specific, from uncertain to certain.

Value System Sensation likewise exists in perpetual flux, manifested as alternating tension intensities and visibility among different value baselines. For example, when the Noetic Stratum's exploratory Value System Sensation dominates, the Vital Stratum's energy balance Value System Sensation resides in the background; but when hunger gradually intensifies, the latter emerges from the background and ultimately occupies the foreground, dominating the system's behavioral orientation. The

flux of Value System Sensation profoundly correlates with the flux of Anticipatory Sensation. Value System Sensation is the starting point of Anticipatory Sensation; its emergence from background to foreground activates related past traces, thereby initiating and guiding the entire process of Anticipatory Sensation's clarification from vague to concrete. The clarification of Anticipatory Sensation is precisely the realization and unfolding of Value System Sensation's flux within specific contexts.

A micro-sculptor's exquisite "touch" is the pinnacle state of their Acquired Value System Sensation and Anticipatory Sensation, achieved through repeated refinement, selection, and consolidation of massive microscopic "Sensation-Behavior" Loops under the deep guidance of innate value baselines. During the Learning process, crude Acquired Value System Sensation (such as "carving is meaningful") gradually differentiates into extremely fine, contextualized Value System Sensation concerning material, force, and angle. Synchronously, Anticipatory Sensation sharpens from vague "this might be better" to precise "this stroke will achieve what specific effect." This precision of expectation originates from "The Remembered Present's" integration and distillation of countless past operational traces.

Throughout this process, the deep tension within Innate Value System Sensation concerning control and efficacy continuously guides the direction of refinement. Each successful Loop Closure—the moment when expectation and result perfectly match—is a confirmation of value, further strengthening successful traces and making future Anticipatory

Sensation ever more precise. Thus, "touch" is by no means simple muscle Memory or automated response; it is the ultimate manifestation of Anticipatory Sensation's Clarity of Anticipatory Sensation, the hallmark of highly refined Value System Sensation, and proof of "The Remembered Present" employed to its fullest.

2.4 Sensation Discrepancy: The Mechanism Driving Learning

When the system detects recognizable mismatch within the "Sensation-Behavior Loop," the core driving force of Learning and adaptation—Sensation Discrepancy—thereby arises.

Unified Definition of Sensation Discrepancy

Sensation Discrepancy is uniformly defined as recognizable imbalance between Immediate Sensation and Anticipatory Sensation. Since Anticipatory Sensation itself is a continuous evolutionary process extending from diffuse Value System Sensation to clear goal-like sensation, Sensation Discrepancy includes both mismatch between Immediate Sensation and Value System Sensation at the most diffuse end (which may be called Initiating Sensation Discrepancy), and mismatch between Immediate Sensation and specific expectations at the clear end (which may be called Verifying Sensation Discrepancy). Ontologically, both belong to the same fundamental mechanism: namely, the gap within the sensation field between what is actually sensed in the present and what ought to be sensed as expected.

Initiating Sensation Discrepancy occurs at the vague starting point of the expectation spectrum. For example, the Immediate Sensation of declining blood glucose levels mismatches with the diffuse Value System Sensation of the innate value baseline "energy ought to remain sufficient," thereby giving rise to the discrepancy sensation called "hunger." At this time, the system can only sense "some kind of discomfort," but this sensation does not yet point to any specific content or solution. This vague mismatch drives the system into "The Remembered Present," activating relevant past traces and prompting Anticipatory Sensation to begin generating and gradually clarifying from chaos.

Verifying Sensation Discrepancy occurs at the clear end of the expectation spectrum. For example, the Immediate Sensation of opening the refrigerator and finding no apples mismatches with the clear expectation "there should be apples in the refrigerator," producing disappointment or confusion. At this time, the expectation itself is sufficiently concrete, so the direction of mismatch is clear, directly driving the system to adjust and update Anticipatory Sensation.

Three Dimensions of Sensation Discrepancy

Sensation Discrepancy can be characterized along three basic dimensions: intensity, direction, and velocity. Intensity signifies the absolute degree of imbalance, directly relating to response urgency. For example, the intensity of hunger or pain determines the priority level of behavioral response. Direction reveals the fundamental nature of imbal-

ance, namely whether Immediate Sensation is superior or inferior to expectation. Positive mismatch (Immediate Sensation superior to expectation) is typically associated with sensations of surprise and satisfaction, driving approach, exploration, and reinforcement; negative mismatch (Immediate Sensation inferior to expectation) is often accompanied by sensations of disappointment and alertness, driving avoidance, correction, and defense. It must be emphasized that positive and negative mismatch exhibit profound asymmetry. Traditional views overemphasize the driving effect of negative mismatch (arising from "lack"), but positive mismatch (arising from "surprise") is equally a powerful Learning force. An intense "pleasant surprise" not only immediately eliminates original tension but also profoundly consolidates the "Sensation-Behavior" Trace that triggered the surprise and significantly elevates related Value System Sensation, thereby driving the system to transcend established patterns toward exploration and innovation. Velocity describes the degree of rapidity in imbalance change. Sudden acute pain versus slowly accumulating discomfort, even if ultimately equal in intensity, elicit entirely different urgency and required behavioral response patterns.

Sensation Discrepancy Drives Learning

The essence of Learning is not the accumulation of static knowledge, but the enhancement of Anticipatory Sensation in clarity and precision. Sensation Discrepancy is the fundamental driving force of this

enhancement process.

Initiating Sensation Discrepancy drives the system's initial exploration. When vague value-laden imbalance appears, the system within "The Remembered Present" activates and integrates past traces, prompting Anticipatory Sensation to preliminarily clarify from directionless vague state into possible solutions with general orientation.

Verifying Sensation Discrepancy drives continuous refinement of expectations. When clear expectations are disappointed in reality, the system calibrates and updates Anticipatory Sensation and related "Sensation-Behavior" Traces according to the direction and intensity of mismatch, making them better fit reality's complex texture.

Positive mismatch plays a key role in reinforcement and innovation. When reality's outcome far exceeds expectations, intense positive discrepancy not only resolves the original problem but also serves as an extra reward, profoundly strengthening the entire causal chain leading to that result and significantly enhancing the Value System Sensation associated with related matters. This drives the system to not settle for simple adaptation but actively seek new possibilities transcending known patterns that can bring surprise.

Ultimately, when expectation and reality precisely match, Sensation Discrepancy is eliminated and Loop Closure is achieved. This successful matching moment reinforces in reverse the closed loop's neural traces, enabling related Anticipatory Sensation to generate more quickly and clearly in the future. The entire journey from unfamiliarity to proficiency

is precisely the flux and growth process whereby Anticipatory Sensation, driven, calibrated, and reinforced through countless Sensation Discrepancies, progresses from vague and generalized toward clear and precise. Sensation Discrepancy, as the perpetual dynamic tension within life's sensation field, reveals the unified source of motive force from microscopic neural adjustment to macroscopic behavioral evolution.

2.5 The Complete "Sensation-Behavior Loop": From Sensation Discrepancy to Loop Closure

Having systematically expounded upon Sensation Discrepancy and Anticipatory Sensation, we can now fully depict the entire dynamic process of the "Sensation-Behavior Loop." The essence of this process is the continuous flux of Anticipatory Sensation within the sensation field: from initially diffuse Value System Sensation, to gradual clarification, ultimately matching Immediate Sensation at Loop Closure.

The loop begins with Immediate Sensation—the system's direct sensation of its own current actual state. Whether internal blood glucose decline, body temperature drop, or the appearance of an external stranger, all constitute the loop's initial perturbation.

Immediately following, Immediate Sensation modulates the relative tensions among various Value System Sensations throughout the entire sensation field. It does not "activate" some dormant value module, but rather adjusts the visibility relationships among those value baselines that always co-exist at different concentrations. The Value System Sen-

sation (such as energy balance) profoundly related to the current perturbation intensifies its tension, emerging from background to foreground, dominating the system's overall orientation; while other Value System Sensations (such as cognitive exploration) relatively recede. The system's dominant Value System Sensation thereby undergoes transition.

When a recognizable gap appears between this prominent, diffuse Value System Sensation (as the most diffuse starting point of the expectation spectrum) and Immediate Sensation, Initiating Sensation Discrepancy thereby emerges. For example, the mismatch between blood glucose level and the baseline sensation of "energy ought to be sufficient" generates as the concrete sensation of hunger. This diffuse discrepancy drives the system into "The Remembered Present," initiating the generation of Anticipatory Sensation.

Within "The Remembered Present," the system re-senses past relevant "Sensation-Behavior Traces" and integrates Immediate Sensation, Value System Sensation, and Sensation Discrepancy. Anticipatory Sensation thereby gradually clarifies from vagueness. Its clarity continuously increases: from the initially diffuse Value System Sensation knowing only "there is some discomfort," transitioning to the semi-clear orientation of "may need to seek food," ultimately condensing into the concrete and definite expectation "there should be apples in the refrigerator." This clarification process directly drives Behavior from aimless exploration toward directional, even precise, action.

The clear Anticipatory Sensation itself directly drives specific Be-

havior. The clear Anticipatory Sensation "there should be apples in the refrigerator" naturally leads to the coherent action of "walking to the kitchen and opening the refrigerator."

Behavior's unfolding inevitably triggers new Immediate Sensation. The system immediately compares it with Anticipatory Sensation, potentially producing three outcomes:

First is matching and Loop Closure. When apples are found as expected, Immediate Sensation perfectly aligns with Anticipatory Sensation, and Sensation Discrepancy dissolves. This moment of successful matching not only eliminates tension but also strengthens the neural traces of this closed loop, elevating the future clarity of related expectations.

Second is negative mismatch and expectation updating. If the refrigerator is empty, the new Immediate Sensation mismatches with expectation, producing negative Verifying Sensation Discrepancy (such as disappointment). This discrepancy drives the system to adjust expectations, possibly forming the new expectation "need to go to the supermarket to purchase," thereby initiating the next round of the loop.

Third is positive super-expectation and value reinforcement. If the refrigerator contains not only apples but also beloved strawberries, the immediate sensation of surprise far exceeds the original expectation, producing intense positive Verifying Sensation Discrepancy. This "pleasant surprise" deeply consolidates the action traces triggering this result and significantly elevates the value coloring of related matters or

contexts, potentially stimulating the system to hold higher expectations for the future.

Ultimately, the loop either concludes with matching, achieving temporary balance and Loop Closure; or continues to flow due to mismatch, adjusting expectations and driving new exploration; or gains additional value reward due to super-expectation, reinforcing existing action pathways.

This complete "Sensation-Behavior Loop" dynamic process provides a sensation-based ontological framework for unified understanding of traditional psychology's concepts. Need, here corresponds to some Value System Sensation occupying dominant position in the sensation field; Motivation directly stems from Sensation Discrepancy itself (whether from negative tension arising from "lack" or positive pull arising from "surprise"); Goal is clarified Anticipatory Sensation; action is the embodied output driven by Anticipatory Sensation; feedback is the comparison process between new Immediate Sensation and expectation; and satisfaction is precisely the balance state regained when Loop Closure occurs and Sensation Discrepancy dissolves. Thus, the entire loop is far from a simple "stimulus-response" chain, but rather a vivid process in which Anticipatory Sensation grows from vague to clear through sensation's flux, its matching or mismatching with Immediate Sensation (i.e., Sensation Discrepancy) drives Behavior, and it is continuously calibrated, reinforced, or reshaped through interaction with the world. Understanding this loop is understanding how life plans itself through sensa-

tion, seeks certainty within uncertainty, and inscribes its existential trajectory through continuous dialogue with the world.

2.6 Chapter Summary

Beginning from the basic principles of Neural Darwinism, this chapter has systematically expounded how "Sensation-Behavior Closed Loops" grow from their innate, crude form into acquired refined and adaptive complex structures. This generative process is not the operation of a single mechanism, but the result of multi-level coordinated flux.

At the foundational level of neural implementation, we have analyzed the mechanism by which whole-brain functional ensembles form closed loops through dynamic competition, clarified "Reentry" as the neural scaffold optimizing closed loop internal coordination, and revealed how Hebbian plasticity is tuned by Value System Sensation, thereby achieving adaptive consolidation of behavioral traces.

At the level of Value System Sensation, this chapter has elucidated the core process of its "embodiment" from innate diffuse state into acquired concrete networks. The dynamic adjustment of evaluative sensation, the key mechanism of value-dependent selection, and the extension and differentiation of value itself jointly constitute the dynamics of Value System Sensation's growth. Among these, value-dependent selection constitutes the fundamental shaping principle: not all "Sensation-Behavior" traces are equally strengthened; only those traces capable of predicting or leading to innate value satisfaction are selectively consoli-

dated and highlighted under the global modulation of Value System Sensation. This further establishes the core insight that "value itself is adaptive"—what constitutes "good" and "bad" is not innately fixed doctrine, but flowing standards continuously redefined and adjusted through sensory experience.

At the level of sensation process flux, we have tracked how Immediate Sensation continuously perturbs the system through various forms such as internal gradual changes, external sudden changes, or cognitive leaps, and expounded how this flux, as raw material, is integrated within "The Remembered Present." Through "re-sensation" of past Sensation-Behavior Traces, Anticipatory Sensation continuously grows and differentiates from diffuse Value System Sensation, ultimately clarifying into concrete goal-like sensation.

The core driving force propelling the entire system from crude toward refined is precisely Sensation Discrepancy—the recognizable imbalance between Immediate Sensation and Anticipatory Sensation. Its three dimensions of intensity, direction, and velocity characterize each imbalance's unique configuration and drive Learning's occurrence. Learning's essence is thereby revealed as the enhancement of Anticipatory Sensation in clarity and precision, rather than the accumulation of static knowledge.

Ultimately, a complete "Sensation-Behavior Loop" is presented: from Sensation Discrepancy's generation, through Anticipatory Sensation's clarification and behavioral drive, to new Immediate Sensation's

comparison with expectation leading toward Loop Closure, expectation updating, or value reinforcement. This loop is not a mechanical reflex arc, but a dynamic process in which Anticipatory Sensation continuously generates, calibrates, and realizes itself through flux.

The core thread running through this chapter is: life is a process continuously generating itself through sensation. All Value System Sensations and their potential behavioral orientations continuously co-exist as inherent possibilities within the sensation field, their visibility and intensity dynamically adjusting with the flow of Immediate Sensation. From innate diffuse value baselines to acquired refined Value System Sensation networks and Anticipatory Sensation constitutes a continuous dynamic process. Acquired Value System Sensation becomes the "predictor" and refined realization of innate baselines; and the plasticity of Value System Sensation itself is precisely the foundation of Learning, adaptation, and creative growth.

This generative process from innate to acquired establishes a solid foundation for understanding higher-level complexity. In the chapters that follow, we will see how the sentient structures of the Social Stratum and Noetic Stratum emerge layer by layer from the interaction and interweaving of these vital substrates.

Chapter Three

Generation of the Social Stratum and Noetic Stratum

The grand architecture of mind continues its upward growth upon the foundation laid by the Vital Stratum. When multiple sentient systems begin to perceive and interweave with one another, the Social Stratum emerges from the Vital Stratum's interactions; when sentient systems begin to take their own neural activities as objects of sensation, the Noetic Stratum generates upon the interwoven foundation of the Social Stratum. This chapter will reveal how these two strata naturally grow from "Sensation-Behavior" Loops and demonstrate how they jointly construct the complex totality of human mind and civilization.

3.1 The Birth of Social Sentience: Resonance and Expansion of Shared Sensation

The birth of sociality does not originate from a single driving force. It is first deeply rooted in the innate closed loop of "sexuality/reproduction" at the Vital Stratum, constituting its irreducible Primary Foundation; subsequently, through experience, through convergence and Resonance of "Sensation-Behavior" patterns among systems, it forms broader and more complex connection networks—this is the continuously expanding Secondary Foundation.

The Vital Archetype of Sociality: Beginning with "Sensation-Behavior" Resonance in Unicellular Organisms

Sociality—the coordination among multiple independent living systems to obtain joint survival advantages—has its most primitive form already contained within unicellular life. Bacterial "quorum sensing" provides an example: individual bacteria continuously secrete and detect specific chemical signal molecules. When conspecific individuals in the environment reach a certain density, signal molecule concentration breaks through a critical threshold, and all bacteria, based on this shared chemical "sensation" input, synchronously enter a dynamically emergent coordinated state—such as bioluminescence, biofilm formation, or toxin release.

Viewed from the sentient perspective, this process displays a complete microscopic closed loop: shared sensation (shared detection of the same chemical signal), behavioral synchronization (threshold breakthrough triggering goal-directed collective Behavior), Resonance and consolidation (individuals achieving precise synchronization of "Sensation-Behavior" patterns through chemical media, forming a functionally unified temporary whole). This synergistic pattern, because it brings significant survival advantages, gains positive value and is thereby selected and consolidated through evolution. The most profound starting point of social sentience is precisely this tendency of vital organization to achieve pattern Resonance through shareable "sensation" and to be stabilized through joint functional advantages.

The Primary Foundation of Sociality: Kinship Bonds and Hereditary Sensation Patterns

In higher life, especially animals, the most solid and direct Primary Foundation of sociality lies in kinship relationships formed through "sexuality/reproduction" drive. This is not merely biological connection, but the foundation of innate similarity in Sensation-Behavior patterns.

Sexual desire, as a powerful and periodic Meta-Sensation, directly drives courtship and mating Behavior; its biological result is establishing primitive bonds based on gene sharing among individuals. The appearance of offspring brings novel Systemic Feelings: the vulnerability of young (such as crying, coldness) triggers in the parental system a tension mixing Defensive alertness with Empathic tendency—"caregiving impulse." Behaviors such as nursing and protection can relieve this tension, accompanied by the positive evaluation of "satisfaction in bloodline continuation." This closed loop of "offspring appearance → caregiving impulse → parental Behavior → tension relief" becomes the first stable and high-cost "social behavioral closed loop," directly giving rise to the most profound altruistic attachment.

Blood relatives, through shared genes, naturally possess similarity in their nervous systems' structural functions, Meta-Sensation thresholds, and innate behavioral closed loop patterns. This hereditary similarity in sensation patterns provides an irreplaceable biological substrate for deep empathy and seamless cooperation, constituting the solid Primary Foundation of higher animals' sociality.

The Secondary Foundation of Sociality: Shaping and Recognition of Shared Sensation-Behavior Patterns

Transcending kinship, sociality's broader domain is constructed by the Secondary Foundation of "shared Sensation-Behavior patterns." Common geographical environment and survival challenges prompt groups to develop convergent coping strategies, which sediment as shared sensation worlds and response repertoires. Language, customs, rituals, art, and values are a vast system of "Sensation-Behavior Traces" shared by group members. Learning culture is, through "Reentry" and imitation, internalizing others' Sensation-Behavior patterns as part of one's own neural structure.

Empathy and sympathy find their essence here: their neural mechanism is based on Sensation-Behavior Resonance, allowing one individual to partially "re-sense" another individual's feeling state; their psychological essence is the capacity to understand and simulate others' internal patterns based on one's own Sensation-Behavior Traces. The more shared patterns, the deeper and more accurate the empathy.

The Three-Dimensional Dynamic Structure of the Social Stratum

Continuing from the Vital Stratum, the Social Stratum's sentience is likewise driven by the Three Basic Tensions, but their manifestation forms undergo fundamental transformation.

Defensive → Group Belonging: From guarding individual physi-

cal boundaries, sublimating to maintaining group identity. Its sensation is the fear of being excluded and isolated; its Behavior is the effort to seek acceptance and integration; its value is the deep sense of security of "belonging to this group."

Aggressive → Hierarchical Status: From direct acquisition of material resources, transforming to competition for social resources (such as power, prestige, influence). Its sensation is the frustration and unwillingness when status is low; its Behavior is competition, display, and striving for recognition; its value is the sense of confirmation of "having weight within the group."

Empathy → Altruistic Attachment: From individual life rhythm's continuation, expanding to active care for others' welfare, and becoming the pathway through which the individual's own Sensation-Behavior patterns and thought concepts are transmitted and continued through connection. Its sensation is empathy for others' circumstances and longing for connection; its Behavior is helping, sharing, even sacrifice; its value is the warmth and meaning of "we are together," and the profound realization of one's own existence continuing through others.

These three dimensions interweave to constitute the basic dynamic field of social sentience. From intimate family interactions to macro international politics, all social Behaviors can be traced within this dynamic force field to their initial sensation vectors and evolutionary pathways.

3.2 Emergence of the Noetic Stratum: Internal Neural Activity as Sensation Object

The Sentient Foundation of Cognition: Internal Neural Activity as Sensation Object

The Noetic Stratum's distinctiveness stems from a fundamental transformation in the object of its "sensation": the brain begins to take its own internal neural activity as the direct source of sensation. The emergence of recall, the connection of concepts, the advancement of reasoning—these thinking activities themselves constitute the Noetic Stratum's basic sensation content.

The reason this "sensation of neural activity itself" is possible lies in the neural foundation of whole-brain scale "Reentry" mechanism. It is precisely the sustained, parallel bidirectional signal exchange among different brain regions that enables specific neural activity patterns to be "sensed" again by the system itself, thereby forming the starting point of internal awareness. Without Reentry, neural activity would merely be unidirectional "occurrence"; through Reentry, activity can be "re-sensed" and integrated. This internal sensation specifically presents as two intertwined levels: first is sensation of activity content (such as directly "sensing" the concept "apple" or some logical relationship), second is sensation of the activity process's qualitative state (such as the "fluency," "blockage," or "excitement of insight" accompanying the thinking process). These two together constitute the Noetic Stratum's vivid sentient

state.

Based on these internal sensations, the system triggers new, spontaneous neural activity as response. For example, when "sensing" that thinking has become blocked, the system may spontaneously activate another set of related concept traces or switch thinking strategies. This directional reorganization and discharge of internal neural signals is itself a cognitive-level "Behavior," an implicit "thinking action."

Thereby, a "Sensation-Behavior Loop" operating entirely within the neural interior is established: internal neural activity as sensation input triggers new internal neural activity as behavioral output, while new activity generates new internal sensation. It is precisely the complexity of this internal circuit supported by Reentry that enables "The Remembered Present"—fusing past thinking traces, immediate internal sensation, and future expectations in this moment—to become possible at the cognitive level, thereby providing the sentient foundation for all higher mental functions such as thinking, imagination, and reasoning.

The Three-Dimensional Dynamic Structure of the Noetic Stratum: Differentiation of Exploration Space, Method, and Language

Continuing from the Vital Stratum and Social Stratum, the Noetic Stratum's operation is likewise driven by three basic tensions. Within the cognitive sensation field, these three tensions merge, flux, and sediment through experience and culture, gradually emerging as three distinctly

characterized cognitive pathways: respectively oriented toward the external objective world, internal subjective world, and transcendent realm. They each have focal points in exploration space, research method, and language form, jointly constructing the rich dimensions of human civilization.

Defensive tension here transforms into the pursuit of certainty; its typical pathway is scientific exploration. Its Sensation Discrepancy is a cognitive unease, stemming from the unknown of the external world or mismatch between experimental results and theoretical expectations. The driven Behavior is systematic scientific exploration, aimed at eliminating this unease. Its exploration space points toward external environment and objective objects; the core of its research method is objectification—striving to transform all phenomena, even Consciousness itself, into observable, modelable objects. Its pursued Goal is truth; its language form is highly logical; the basic unit of its semantics is concepts and formulas.

Aggressive tension here transforms into the impulse to express and shape; its typical pathway is artistic creation. Its Sensation Discrepancy is an expressive tension, stemming from mismatch between the fullness of internal experience and the insufficiency of existing expressive forms. The driven Behavior is artistic creation, the active shaping and externalization of internal feeling energy. Its exploration space shifts from external to internal subjective domains; the core of its research method is subjectivization—not only endowing living organisms with internal per-

spective, but through art's prism, making inanimate objects evoke profound sensation Resonance in the viewer's heart. Its pursued Goal is authenticity (a highly subjective, human authenticity); its language form is poetic; the basic unit of its semantics is metaphor.

Empathic tension here transforms into longing for meaning and connection; its typical pathway is religious cognition. Its Sensation Discrepancy is the yearning for ultimate meaning, eternity, and infinity, profoundly mismatched with one's own finitude. The driven Behavior is religious cognition, the cognitive effort to integrate the individual's tiny sentient loop into some grand, eternal closed loop. Its exploration space simultaneously transcends and encompasses the ultimate existential realm beyond subject and object; its research method may be called personalization—in profound personal experience and cultivation, seeking connection with transcendent existence. Its pursued Goal is mystery; its language form is symbolic; the basic unit of its semantics is symbolic signs.

The integration of defensive extraversion, aggressive introversion, and empathic chronoverion constitutes the entire existential space of the organism.

Thought Memes: Sensation-Behavior Carriers of the Noetic Stratum

At the Noetic Stratum, the carriers of "Sensation-Behavior" Loops are no longer concrete bodily movements or chemical signals, but

"Thought Memes"—replicable information units encapsulating specific cognitive sensations and corresponding behavioral patterns. A scientific theory, a melody, or a religious belief can all be viewed as a "Thought Meme"; it contains both unique cognitive sensation (such as wonder at cosmic harmony) and implicitly contains specific ways of exploring or expressing it (such as mathematical deduction or ritual practice).

"Thought Memes" are transmitted among different sentient systems through imitation, Learning, and cultural dissemination. Successful transmission means the receiver has regenerated cognitive sensations similar to the transmitter's within their own system and internalized related cognitive behavioral patterns. Scientific paradigms, artistic schools, and religious doctrines are essentially specific "Thought Meme" clusters.

The survival and dissemination of "Thought Memes" likewise follows "value-dependent selection." A "Thought Meme" that can more effectively dissolve cognitive unease, express internal Emotions, or settle ultimate concerns will be assigned positive value due to the profound cognitive satisfaction it brings, thereby being selected, transmitted, and undergoing creative transformation within a "cognitive community." An individual's acceptance of some thought is essentially their internal cognitive activity producing profound "Resonance" with external Thought Memes.

Cognitive Closed Loops: From Individual Contemplation to Civilizational Accumulation

The Noetic Stratum's "Sensation-Behavior" Loop constructs a grand "cognitive closed loop" capable of continuous accumulation and iteration.

At the individual level, one cognitive closed loop might manifest as: research Behavior driven by curiosity (Sensation Discrepancy), ultimately gaining new understanding, satisfying specific cognitive Needs, achieving tension relief and Loop Closure.

At the civilizational level, the products of countless successful individual cognitive closed loops—new, valuable "Thought Memes"—are screened, consolidated, and merged into culture's knowledge traditions, providing later generations with higher cognitive starting points. Through such generational accumulation, human cognition continuously approaches deeper objective laws, expresses more subtle subjective worlds, and explores more sublime meaning connections.

The peak state of the Noetic Stratum's loop efficacy is embodied in insight and innovation. When the system internally conducts high-intensity, multi-dimensional "Reentry" operations and collisions among multiple "Thought Memes," once some entirely new connection pattern is instantaneously "selected" and perfectly eliminates core Sensation Discrepancy, it triggers dramatic release of cognitive tension and intense positive evaluative affect. This sudden and efficient Loop Closure of the internal closed loop manifests subjectively as "insight" or "inspiration."

Innovation is the realization and unfolding in the external world of the new "Thought Meme" gestated by this internal process.

3.3 Neural Foundation of Social Sensation-Behavior Resonance

The preceding two sections have depicted the picture of the Social Stratum and Noetic Stratum generating from "Sensation-Behavior" Loops. The fundamental question that follows is: how can one sentient system possibly understand another system's internal state? This section will elucidate that the so-called "mirror" phenomenon is not an independent "mind-reading" module, but rather the neural realization of "social Sensation-Behavior Resonance" capability naturally emerging from the Sensation-Behavior Closed Loop system, based on Degeneracy, through value-dependent associative Learning.

From "Mirror" to "Resonance": Sentient Reconstruction of Social Understanding

There do not exist innately fixed neurons specifically encoded for "understanding others' Behavior" in the brain. Rather, when an individual repeatedly experiences an effective "Sensation-Behavior Loop" closed loop (such as "grasping"), a specific "Sensation-Behavior" neural ensemble containing motor signals, proprioception, and successful expectation (value) becomes consolidated. Due to the nervous system's Degeneracy, achieving the behavioral category of "grasping" can be accomplished by multiple different neuronal group combinations.

In an individual's developmental experience, the two contexts of "executing grasping oneself" and "seeing another grasp" are highly correlated on the Sensation-Behavior Loop, sharing similar efficacy and value implications. Through Hebbian Plasticity modulated by Value System Sensation, strong connections form between the visual features of "seeing grasping" and the Sensation-Behavior Loop ensemble corresponding to the individual's own "executing grasping." Therefore, when observing others' Behavior, the observer's own internal degenerate, corresponding "Sensation-Behavior" ensembles can be directly and partially activated.

Understanding others' Behavior is not cold computation, but rather an "internal simulation" or "neural reenactment" of others' states by the observer based on their own Sensation-Behavior experience. This enables the observer to generate an embodied "direct re-sensation" regarding what the other might be sensing.

The Sentient Pathway of Empathy and Cultural Transmission

This "Resonance" mechanism provides the fundamental pathway for realizing social sentience.

Emotional empathy is precisely the result of the observer's own emotion-related feeling traces (such as facial movement sensation during sadness, internal negative value evaluation) being resonantly activated when observing another's emotional expression (such as sadness).

Cultural "Thought Memes" such as dance, ritual, and artistic style are essentially complex, group-shared "Sensation-Behavior" patterns. The mirror mechanism enables these patterns, through observation and imitation, to trigger similar neural Resonance across different brains, thereby achieving efficient cultural transmission and group identity. That a nation's dance can trigger widespread Resonance is precisely countless individual nervous systems producing synchronized "internal reenactment" of the same movement pattern.

Degeneracy is fundamental to ensuring this social cognitive system is both robust and flexible. When the system encounters a complex Behavior never seen before, by virtue of its degenerate network structure, it can activate multiple existing, partially relevant "Sensation-Behavior" category ensembles, and through "Reentry" integrate an approximate, optimal understanding (i.e., "categorizing it into the closest known category"). Subsequently, through new interactive experience, the system will, according to value-dependent selection mechanisms, calibrate and refine this preliminary Resonance pattern, potentially ultimately forming a more precise new understanding category, thereby continuously enriching and expanding its social cognitive capacity.

3.4 The Unified Logic of Generation: Organizational Principles of Vital Resonance

Having separately traced how the Social Stratum and Noetic Stratum generate from the Vital Stratum's foundation, a profound discovery

emerges: from microscopic synchronization of neural activity to macroscopic cohesion of civilizational structure, the same deep and powerful generative rhythm resonates behind them. Life's organization, spanning utterly different scales, follows a highly unified logic.

At the neural level, whole-brain scale "Reentry" signal circulation brings about synchronized activity of neuronal ensembles, forming internal transient Resonance. If the activity result of this temporary functional unity is judged "adaptive" by diffuse Value System Sensation, it gains positive value evaluation and is thereby selectively consolidated, forming a stable functional ensemble—this is the most microscopic "Resonance circle," the neural substrate of every effective sentient state.

At the social level, sustained interaction among individuals through language, Behavior, and cultural symbols (a social form of "Reentry") shapes "shared Sensation-Behavior patterns," triggering widespread Resonance among groups. When such shared patterns can bring satisfaction of belonging, respect, or emotional connection, they constitute powerful social positive value. This value, like invisible bonds, tightly coheres countless individuals within nested "social Resonance circles" from family to nation.

At the cognitive level, "Thought Memes" spread and collide through abstract symbols within and among individuals (a cognitive form of "Reentry"); when they deeply align with individuals' internal cognitive sensation structures, they spark intense Resonance of reason or belief. A theory, an artistic style, or a belief system, if it can effectively

dissolve cognitive unease, fluently express the internal world, or settle ultimate concerns, will harvest cognitive-level positive value evaluation, thereby attracting followers and forming stable "cognitive Resonance circles" sharing the same paradigm, such as scientific communities or artistic schools.

This generative rhythm of "Resonance-Evaluation-Consolidation" constitutes the deep principle by which sentient systems self-construct across strata. It reveals to us: the internal cohesion of a scientific school and the stable existence of a neuronal functional ensemble are manifestations of the same generative logic at different levels—they are both carriers of more optimized "Sensation-Behavior" Closed Loops selected and consolidated by their respective levels' Value System Sensation.

Understanding this unified logic grants us a key to decoding all complex structures from mind to civilization. It enables us to see that life is not only continuous in evolutionary history but also profoundly unified and coherent in its core generative principles for constructing its own complexity.

3.5 Dominant Dynamics and Background Tonality

From the perspective of the Sentient Principle, we can penetrate the surface of Behavior to perceive the deep dynamics surging beneath—those basic tensions interwoven by Defensive, Aggressive, and Empathic forces. However, life's actual experience in each moment is by no means

dominated by a single dynamic alone. Just as a forest is constituted by diverse life forms, a melody interwoven by multiple harmonies, the existential state of a sentient system is always a three-dimensional and fluxing "sentient field" jointly composed by multiple sensation dynamics.

From Static Classification to Dynamic Field

If we regard the nine categories distinguished by the three-dimensional dynamic structure as nine continuously sounding voices, we can grasp the authentic picture of the sentient system's operation.

Dominant sentience is the voice with the highest intensity in the current "Sensation-Behavior Loop," concentrating the system's attentional focus and directly driving overt or covert Behavior. It is the prominent theme in the melody, the illuminated protagonist at center stage. For example, when a deadline approaches, that all-absorbing, action-driving Noetic Stratum-Defensive tension (eliminating task uncertainty) may become dominant.

Background sentience consists of those voices with lower intensity yet persistent existence, modulating the system's overall state and endowing experience with deep undertone. They are the supportive harmonies in music, the stage's scenery and atmospheric lighting. In the same deadline scenario, the Vital Stratum-Empathic rhythmic dysregulation (fatigue from continuous work) and the Social Stratum-Aggressive subtle expectation (desire for recognition through excellent performance) may continuously resonate in the background, jointly modulating the

overall texture and emotional coloring of action.

Dominant dynamics determine "what we do," while background tonality profoundly shapes "how we do it," and even the entire process's emotional tone and energy expenditure.

Dynamics of Dominance and Background

This sensation field is by no means static; its interior is full of vivid dynamics.

Competition and switching: The arrival of an intense stimulus can instantly reshape the field's power configuration. When immersed in the spiritual fusion of epic narrative (Noetic Stratum-Empathy dominant), news of a relative's sudden illness may cause Social Stratum-Empathic tension (deep concern for the relative) to suddenly erupt, replacing the former as the new dominant, driving complete behavioral reorientation.

Cooperation and modulation: More often, dominance and background collaborate in complex ways, shaping unique behavioral manifestations. A manager striving for team interests (Social Stratum-Aggressive dominant) whose Behavior is simultaneously modulated by Vital Stratum-Empathic fatigue and Noetic Stratum-Defensive need for caution may appear more irritable or more thorough than usual.

Cross-level driving: Most subtle is the conduction and transformation of dynamics across different levels. An artist's intense expression of inner world (Noetic Stratum-Aggressive dominant) may derive its deep fuel from Social Stratum-Defensive longing for belonging or So-

cial Stratum-Aggressive desire for recognition. Social Stratum dynamics here transform into the source of Noetic Stratum creative explosion.

Confusing dominance with background, or ignoring background tonality's existence, often leads to superficial or even erroneous diagnoses. In Self-insight, simply attributing "low work efficiency" to insufficient Noetic Stratum dynamics while ignoring the foundational influence of chronic sleep rhythm dysregulation (Vital Stratum-Empathy background) may lead to twice the effort for half the result. In interpersonal understanding, directly equating a child's "aggressive Behavior" with Aggressive dynamics dominance without perceiving the possible underlying Social Stratum-Defensive resistance to exclusion or Social Stratum-Empathic longing for connection may miss true understanding and help.

Therefore, becoming a "sentient person" means not only identifying the inner "main melody" but also cultivating ears that can hear all "harmonies." What we need to ask is not only "what dynamics are driving me" but also "what other dynamics are resonating in the background, and how are they shaping my actions and existential state."

This dynamic field picture of dominance and background prompts us to hold deeper reverence and compassion for life's complexity. It reminds us that any singular behavioral interpretation may be a simplification, and any effective self-adjustment or understanding of others must be built upon systematic contemplation of the entire sensation field.

3.6 From Animals to Humans: Revolutionary Transformation of Social Foundation

The most profound difference between animal and human societies lies not in the presence or absence of sociality, but in the fundamental shift of the dominant foundation constructing sociality.

Animal Societies: Limited Expansion Dominated by “Primary Foundation”

Animal social structures, their scale and complexity mainly dominated by the “Primary Foundation” of kinship relationships and hereditary sensation patterns. Whether wolf packs, lion prides, or ape groups, their cooperation, altruism, and hierarchical order can mostly be explained within the framework of kin selection. Even when sporadic “cultural” transmission exists (such as certain tool-use skills), its scope and influence are extremely limited, unable to break through biological hard constraints. Animal societies are essentially relatively closed Sensation-Behavior Resonance circles profoundly imprinted by genes and kinship.

Human Societies: Leap to “Secondary Foundation” and Unlimited Expansion

Humanity accomplished a profound social revolution: the "Secondary Foundation"—namely "shared Sensation-Behavior patterns" shaped through culture—replaced the "Primary Foundation" to become the dominant force constructing large-scale social coordination. Culture's powerful plasticity enables humans to transcend kinship's narrow

boundaries, incorporating countless strangers into a shared meaning and behavioral field. An urban engineer and a grassland herder can generate strong belonging and coordinate action due to shared identification with nation or certain ideals.

The emergence of abstract symbol systems (language, writing, law, currency) enables complex "shared Sensation-Behavior patterns" to be precisely encoded, transmitted over distances, and accumulated across generations. This drives exponential growth in human social scale and organizational complexity, from tribes and chiefdoms to nation-states and global civilization. Thus, the essence of human society is an open "Sensation-Behavior community" built upon cultural Secondary Foundation that can be continuously imagined and reconstructed. Kinship bonds still exist but are no longer the primary basis for constructing grand social order.

However, this revolutionary transformation is by no means a rupture-style replacement but the continuation and leap of evolution's flow. A consistently evolutionary perspective must acknowledge not only that humans possess certain animality but also that animals possess a certain degree of humanity. The Primary Foundation has never been completely abandoned; as the deep undertone of sociality, it continues resonating in kinship bonds and instinctive empathy; while the Secondary Foundation's seeds are already faintly discernible in higher animals' limited cultural transmission. It is precisely this continuity across species boundaries that enables the Sentient Principle to run through from unicellular

chemical sensing to humanity's grand civilizational symphony.

From Circles to Civilization: The Expansion Logic of the Social Stratum

Social structure's expansion follows the degree of similarity and Resonance in "shared Sensation-Behavior patterns." Tight circles, centered on kinship and high-frequency interaction, with highly synchronized patterns, form the strongest bonds (such as family, close friends). Expanded circles, based on shared culture, values, or professional skills, form highly similar patterns in specific domains, constituting nations, professional groups, or academic communities. Imagined communities, based on commonly internalized grand abstract narratives (such as nation, ideology), enable countless strangers to generate strong Resonance and belonging through sharing a set of "Sensation-Behavior" narratives. This belonging, as a powerful positive value evaluation, coheres individuals within grand social structures named civilization or faith.

This expansion journey from kinship to culture, from concrete to abstract, reveals the uniqueness of human sociality: it broke free from biology's hard constraints and, through culture's flexible shaping, achieved nearly unlimited expansion of social structure.

* * *

This chapter has traced how the Social Stratum and Noetic Stratum generate from the Vital Stratum's foundation. Social sentience begins with unicellular organisms' Sensation-Behavior Resonance, passes

through kinship bonds' Primary Foundation, and ultimately, through culture-shaped Secondary Foundation, achieves the revolutionary leap from animal societies to human civilization. The Noetic Stratum's emergence stems from the system taking its own neural activity as sensation object, thereby opening a new dimension of internal "Sensation-Behavior" Loop.

The core insight pervading this chapter is: from neural ensemble stabilization to social group cohesion to thought community formation, all follow the unified generative logic of "Resonance-Evaluation-Consolidation." It reveals the deep principle by which life constructs complexity at different scales.

The Social Stratum's three-dimensional dynamic structure (group belonging, hierarchical status, altruistic attachment) and the Noetic Stratum's three-dimensional dynamic structure (scientific exploration, artistic creation, religious cognition) are all manifestations of refined differentiation and flux of the Three Basic Tensions at higher organizational levels, not new tensions.

The dynamic field constituted by dominant dynamics and background tonality displays the authentic operational appearance of the sentient system: all dynamics always co-exist at different intensities; dominant dynamics determine "what to do," while continuously resonating background tonality profoundly modulates "how to do." Understanding this point is crucial for Self-insight and interpersonal understanding.

The neural foundation of social Sensation-Behavior Resonance indicates that the so-called "mirror" phenomenon is not an independent

module but a capacity naturally emerging from the Sensation-Behavior Closed Loop system through Degeneracy via value-dependent associative Learning. This provides a unified explanatory substrate for empathy and cultural transmission.

The transformation of social foundations from animals to humans reveals that human civilization's characteristic lies in the leap from kinship-dominated limited expansion to culture-dominated unlimited expansion. It is precisely this transformation that makes constructing grand civilizational structures transcending biological constraints possible.

This generative epic from Vital Stratum to Social Stratum to Noetic Stratum displays how the sentient system, starting from the most basic sensation tensions, gradually constructs the magnificent edifice of human mind and civilization. Each level is rooted in the same dynamic archetype, follows the same dynamic principles, and realizes its unique functions through "Sensation-Behavior" Loops.

In the appendices, we will employ this unified framework to reconstruct core concepts of traditional psychology, revealing their essence under the Sentient Principle. But these contents will be presented as appendices, because they belong to "appearances" rather than the sentient system itself. Our core task remains always to directly confront the entity casting all shadows—living, sensing life itself.

Appendix One:

Reconstruction of Traditional Concepts

Introduction: From Shadows to Entity

Since psychology and physiology formed as systematic disciplines, they have constructed a series of concepts to describe mental phenomena, such as Behavior, Need, Emotion, Memory, Consciousness, Will, Self, Personality, etc. These concepts are like light-and-shadow sketches drawn from different angles for the entity casting the shadow, helping us capture certain contours and dynamics of its internal processes from the outside. However, when our inquiry becomes overly focused on depicting these shadows themselves, we may neglect to question that unique entity casting all shadows—the living sentient system itself, actually sensing and acting.

Traditional psychology faces a fundamental methodological dilemma: its research typically begins with third-person "objective" observation of Behavior and attempts to thereby infer or construct first-person internal experience. In this transformation, the essence of experience is often replaced or obscured by its observable representations. The path of the *Sentient Principle* is a thorough reversal: it directly stands upon first-person, irreducible internal experience itself, aiming to reveal the authentic substrate that traditional concepts attempt to refer to, tracing all phenomenal descriptions back to their sensory origins.

In the pure vision of the *Sentient Principle*, the fundamental events

of existence are only: whether the Sensation-Behavior Loop achieves "Loop Closure"; whether Sensation Discrepancy generates, circulates, or dissolves. This is the dynamic core of all mental phenomena. All traditional psychological concepts can be viewed as descriptions and namings of this pure dynamic process at different levels and degrees of manifestation.

I. Three Levels of Accessibility

Before reconstructing traditional concepts, we must first clarify the issue of "accessibility" of experience and process. This concerns how we understand "knowing" and "being known," and is crucial for grasping the essence of traditional concepts.

Three Levels of Accessibility

1. **First-person evidentially accessible:** Experience content that individuals themselves can directly and certainly sense. For example, "I feel hungry" or "I am feeling angry." This level has ontological priority and is the ultimate criterion for the reality of any psychological process.

2. **Third-person observable:** Related signals or indicators that others or instruments can measure and record from outside. For example, specific facial expressions, heart rate changes, neuronal ensemble firing patterns. These are external correlates of internal processes, "shadows" rather than the "entity" itself.

3. **Implicit:** Those processes that can neither be first-person evidentially perceived nor usually directly observed by third-person tools, yet

continuously exist and profoundly modulate system state. For example, autonomic nervous system adaptive regulation (heart rate, respiratory rhythm), hormone level fluctuations (such as cortisol, adrenaline), vague Value System Sensations persistently existing as background (an ineffable discomfort or comfort), and those automated implicit Sensation-Behavior Loops not captured by focal attention.

Two Levels of "Sentient": Existence and Awareness

Within this framework, we must distinguish two levels of "sentient":

Ontological level: All ongoing or potentially possible Sensation-Behavior Loops belong to the sentient system's activity; this is the essential specification of life as sensing process, not dependent on whether the activity is evidentially perceived by the subject.

Epistemological level: Points to the system's degree of awareness of its own activity. This constitutes a dynamic flux process from focal awareness (highly illuminated by attention), through peripheral awareness (awareness's background domain), to completely implicit modulation. Value System Sensation typically resides at the background or implicit end of this process.

The Goal of "Becoming a Sentient Person"

Therefore, the goal of so-called "self-cultivation" or psychological growth is not "becoming sentient"—we are already sentient beings. Its true goal lies in enhancing awareness's breadth and depth: bringing more background Value System Sensations into the domain of focal awareness;

making those implicitly modulating dynamic processes identifiable and understandable. Achieving this goal depends on the joint effort of first-person refined introspection and the clues and frameworks provided by third-person knowledge.

II. Reconstruction of Traditional Concepts

Behavior: The Third-Person Observable Part of the Sensation-Behavior Loop

Traditional psychology defines "Behavior" as overt actions that can be observed and quantified. This definition, based on the third-person "objective" perspective, is a phenomenal description of the external representation of internal processes.

In the vision of the *Sentient Principle*, the essence of "Behavior" is revealed: it is merely one segment of the "Sensation-Behavior Loop" observable from the third-person perspective. The "overt actions" captured by traditional observation are merely the tip of the iceberg emerging above water. Hidden beneath is the complete dynamic process driving Behavior: including Immediate Sensation, Value System Sensation, Sensation Discrepancy, Anticipatory Sensation, and the new Immediate Sensation arising from their comparison. Traditional psychology's attempt to retroactively infer the entire internal loop from a single behavioral segment constitutes its inherent methodological limitation.

This nature of Behavior also determines the boundaries of its explanatory power: since it is only a partial external manifestation of the

internal loop, it naturally possesses the possibility of "deception"—whether social concealment (covering anger with a smile), discordance between linguistic reports and reality (claiming "I'm fine" while inwardly suffering), or the ambiguity of physiological signals (accelerated heart rate stemming from either excitement or anxiety). The core principle is: first-person direct sensation reports have ontological priority; third-person observation can only serve as corroboration and reference; definite internal experience can never be necessarily derived solely from external Behavior.

Third-person observations, when achieving resonance within specific communities of practice and forming shareable solutions, become sensation-behavior traces that can be accepted and internalized by first-person subjects. Such resonance is not confined to scientific communities, but permeates all domains of human activity, including artistic creation and religious cognition.

It must be clarified that resonance in different domains possesses distinct validity and scope of application, and cannot be uncritically reduced to one another. Once accepted and internalized by the subject, these traces participate in constituting anticipatory sensations and, modulated by value system sensations, become an indispensable component of the remembered present.

Need and Motivation: Value System Sensation and Sensation Discrepancy

Traditional psychology often views "Need" as some objective state of organismic lack, and "Motivation" as the internal force driving Behavior. The boundaries between the two are often blurred, and their definitions likewise root in third-person observation and inference.

The *Sentient Principle* provides more fundamental clarification: the essence of Need is that some Value System Sensation has occupied dominant position in the current sensation field. When the intensity of a tension concerning deep baselines (such as energy balance, boundary integrity, or group belonging) becomes significantly prominent, the system's overall orientation and behavioral readiness state change accordingly. Maslow's "hierarchy of needs" is essentially a categorical presentation of Value System Sensations at different levels (Vital Stratum, Social Stratum, Noetic Stratum). Need does not originate from the objective state of "lack" but from the presence and prominence of some Value System Sensation. All Needs (i.e., various Value System Sensations) always co-exist at different intensities in sensation's background; their dominant position's transformation is a continuous dynamic flux process.

The essence of Motivation is Sensation Discrepancy—namely, the recognizable imbalance between Immediate Sensation and Anticipatory Sensation. It is not an independent "driving force" but the tension inherent in this imbalance itself. The traditionally observed "seeking Behavior" or "drive" is precisely the external manifestation of Sensation Dis-

crepancy driving the Sensation-Behavior Loop's initiation. Motivation's generation depends not on Need's absolute intensity but on the degree of imbalance, itself containing three dimensions: intensity, direction, and velocity. Motivation's satisfaction is not the achievement of abstract Goals, but the process in which the Sensation-Behavior Loop successfully achieves Loop Closure and Sensation Discrepancy is eliminated.

Need and Motivation constitute a unified dynamic sequence: some Value System Sensation continuously exists (Need background); Immediate Sensation's change forms a gap with it, producing Sensation Discrepancy (Motivation foreground); this discrepancy drives the loop until Loop Closure, Motivation recedes, and that Value System Sensation returns to background. The key insight is: Need is persistently existing background tonality; Motivation is foreground dynamic emerging during mismatch; Need provides direction and content for Motivation, but only mismatch itself directly drives Behavior.

Emotion: The Combination of Sensation Discrepancy and Clarity of Anticipatory Sensation

Traditional psychology defines "Emotion" as the subjective experience of events and accompanying physiological responses—this is likewise a phenomenal description based on external observation and reports.

The *Sentient Principle* reveals Emotion's generative essence: Emotion is the sensation state presented by specific combinations of Sensa-

tion Discrepancy and Clarity of Anticipatory Sensation. The traditionally observed facial expressions, physiological arousal, or subjective reports are all external correlate manifestations of this internal combination modulating overall system state. What triggers Emotion is not external events themselves, but the mismatch between Immediate Sensation and Anticipatory Sensation caused by events.

Emotion labels such as "anger," "fear," "joy" are cultural classifications and namings of infinitely diverse combinations of Sensation Discrepancy states (intensity, direction, velocity) and Anticipatory Sensation clarity. Different cultures possess different emotion vocabulary systems, but the underlying sensation dynamic combination principles are universal. Therefore, Emotions are not discrete "types" but categories marking specific sensation "states."

For example, anxiety often corresponds to high-intensity, negative, rapid Sensation Discrepancy accompanied by extremely low Clarity of Anticipatory Sensation (sensing strong threat but not knowing source or coping method); fear corresponds to similar Sensation Discrepancy but with high clarity (clearly knowing threat source and escape direction). Confusion arises from medium-intensity, negative, slow Sensation Discrepancy combined with low clarity (knowing results are wrong but unclear why); disappointment arises from similar Sensation Discrepancy but combined with high clarity (clearly knowing expectations fell through). Satisfaction is a state of low-intensity, positive Sensation Discrepancy combined with high clarity, tending toward elimination (Loop

Closure, return to balance).

Emotion can be understood from two dimensions—temporal and value: temporally, it can be divided into prospective Emotions oriented toward the future (such as anxiety, anticipation) and retrospective Emotions oriented toward past or present (such as regret, satisfaction); in value terms, it corresponds to positive or negative value evaluation. The two exhibit profound asymmetry in dynamics: negative Emotions are typically more lasting and profound, stemming from life's prioritization of danger Memory—forgetting danger once is far more costly than forgetting success once.

Emotion's infinite richness precisely stems from the nearly infinite combination possibilities among Sensation Discrepancy's three dimensions and Anticipatory Sensation's clarity. Understanding Emotion is understanding how this specific sensation combination generates, fluxes, and dissolves within "The Remembered Present." The so-called "complex mood" is precisely a highly integrated experiential state formed when multiple differentiated sensation combinations are simultaneously activated in the current field, interweaving and resonating with one another.

Memory: Consolidation and Re-sensation of Sensation-Behavior Traces

Traditional psychology often describes "Memory" as the process of information being encoded, stored, and retrieved. This definition, stem-

ming from the third-person perspective of objectifying mental activity as operable "information," is a phenomenal description.

The *Sentient Principle* reveals Memory's fundamental essence: Memory is "Sensation-Behavior Trace"—the pattern with specific intensity left upon neural connection structures by past Sensation-Behavior Loops. The recall accuracy, forgetting curves, or recognition capacity observed by traditional research are essentially external manifestations presented when these traces are reactivated in the present. Memory is not the warehousing of static "information" but the consolidation of dynamic "Sensation-Behavior Traces"; recall is likewise not the retrieval of archives but creative "re-sensation" of traces based on this foundation.

Therefore, recall is not extracting a copy of the original from an archive, but rather a fresh, constructive "re-sensation" of past experience based on existing neural traces in the current context and state. Each recall is a unique reconstruction. This "re-sensation" of traces and immediate sensation input, through continuous "Reentry" mechanisms, mutually compare and integrate, jointly generating each moment's unique sentient field. This is precisely what Edelman calls "The Remembered Present"—we never live in the "pure present" but always dwell in a present field interwoven by past, present, and future—this is precisely what Edelman calls "The Remembered Present," and is the authentic mode of existence of the sentient system.

Whether procedural Memory (automated skills), episodic Memory (specific events), or semantic Memory (symbolic knowledge), all unify

as manifestations of "Sensation-Behavior Traces" at different levels and degrees of abstraction. So-called "forgetting" is essentially not information erasure but the intensity of specific traces declining, through prolonged non-activation, below the threshold where the system can effectively "re-sense" them; but under strong cues or specific states, these traces may still be re-evoked.

Consciousness: Self-Experience of the Sensation-Behavior Loop

Traditional psychology defines "Consciousness" as the state of awareness of self and environment—this is likewise a phenomenal description observing internal phenomena from outside.

The *Sentient Principle* indicates that the essence of "Consciousness" is the Sensation-Behavior Loop's self-experience of its own operational process. The content of awareness, attentional focus, or verbal reports that traditional research focuses on are all external correlates of this self-experience process. Consciousness is not an independent "awareness module" or "theater" but rather an ongoing Sensation-Behavior Loop's "re-sensation" of its own activity. It is a continuous process, not a static thing.

Thereby, the traditional "hard problem of Consciousness" in mind-body relations—namely how physical processes produce subjective experience—dissolves within this framework. Experience is not a byproduct "produced" by neural activity; the Sensation-Behavior Loop itself is

a sentient, sensory process. The term "Consciousness" is precisely the naming of this internal sentience. Its neural realization is not some "global workspace" but the unified sentient field integrating distributed neural activity through large-scale "Reentry"—what Edelman calls the "dynamic core"—which is the currently dominant Sensation-Behavior Loop itself.

Consciousness's presentation in experience is a continuous evolution process of awareness clarity, from highly focused focal awareness to vague peripheral awareness, to Value System Sensation as background, to implicit modulation usually not directly accessible. It must be clarified that neural activity is this loop's physical foundation, while awareness experience is its first-person, evidentially manifest presentation—the two are closely related but not identical.

Will: Competition Among Sensation-Behavior Loops

From the traditional perspective, "Will" is often viewed as an internal capacity or force for consciously controlling and regulating Behavior.

The *Sentient Principle* reveals that the essence of "Will" is the process of competition for dominance among multiple parallel Sensation-Behavior Loops potentially pointing toward different Behaviors, and the system's "re-sensation" of this competitive process constitutes the "sense of will." The traditionally observed self-control, delayed gratification, or persistent Behavior is the external manifestation of one loop winning competition and dominating Behavior. Will is not a suspended "spiritual

force" but an internal competitive process.

In this process, loops anchored by long-term internal values (such as completing education, maintaining health) and loops driven by immediate sensation temptations (such as rest, pleasure) continuously compete for the system's limited resources and output channels. The so-called strength or weakness of "willpower" reflects the degree of neural trace solidity of specific loops driven by internal values and their capacity to occupy dominant position in dynamic competition. Therefore, cultivating Will is not abstractly "strengthening willpower" but through repeated, successful practice (i.e., Value-Dependent Selective Stabilization), continuously strengthening those Sensation-Behavior Traces consistent with deep values, enabling them to increasingly gain advantage in competition.

Will's dynamics lie in the fact that all potential loops always exist, their relative intensity continuously fluxing with internal and external contexts. When loops driven by internal values dominate in intensity, it manifests as "firm will"; when loops driven by immediate sensation win out, it appears as "weak will."

Self: The Core Reference Point of the Flow of Sensation

Traditional psychology often conceptualizes "Self" as a stable subject, personality core, or the brain's self-representation model.

The *Sentient Principle* proposes a more fundamental understanding: the essence of "Self" is the core reference point by which the continuous

flow of sensation is organized and recognized. All sensations are marked as "my" sensations; all value judgments take "I" as the implicit anchor. Traditional research's self-identity, self-concept, etc., are precisely this reference point's overt manifestations constructed through experience. Self is not an independent internal "entity" existing alone but a functional organizational center and reference point within the sensation field.

The generation of "sense of self" is a multi-level construction process: beginning with the most basic bodily self-sensing (proprioception of the body in space); through "Reentry" mechanisms, marking various sensations and actions as "mine," forming sense of ownership and agency; in the temporal dimension, through language and narrative, integrating scattered Sensation-Behavior Traces into a coherent autobiographical story, forming narrative Self. All this jointly constructs a unified first-person perspective, becoming the ultimate "container" for all experience and the hidden foundation for value judgment.

Based on this, "self-interested" and "altruistic" Behaviors are fundamentally unified. Both are driven by the most intense Sensation Discrepancy experienced at the "Self" reference point. The difference lies only in the scope of "Self" boundaries: when self-sense is mainly confined to the body, Behavior mostly manifests as "self-interested"; when self-sense, through emotional connection and social identification, extends to include family, community, or even broader existence, others' welfare becomes part of self-sensation, their pain or Need triggers equally genuine Sensation Discrepancy, thereby driving "altruistic" Behavior.

A mother sacrificing herself to protect her child is not "altruistic Motivation" defeating "self-interested Motivation," but rather her "Self" has deeply extended—the child's safety is the safety of her own existence.

Personality: The Unity of Value System Sensation and Repertoire

Traditional psychology often decomposes "Personality" into three relatively independent dimensions for description and analysis: temperament, character, and ability.

The *Sentient Principle* provides a more integrated and fundamental perspective: Personality is the unified manifestation in external expression of the overall configuration of Value System Sensation and the Repertoire of Sensation-Behavior Loops.

Temperament can be understood as the overt tendency of innate Value System Sensation's innate configuration across the Three Basic Tensions of Defensive, Aggressive, and Empathic, primarily determined by evolutionary and genetic factors, constituting the deep undertone of individual response patterns. It must be clarified that traditional "four temperaments" classification is an induction based on behavioral appearances and cannot directly, precisely correspond to the dynamic configuration of internal value tensions. Understanding it requires combining first-person sensation reports, not relying solely on third-person behavioral observation.

Character primarily corresponds to the configuration pattern of Ac-

quired Value System Sensation, shaped by specific experiences and Learning throughout an individual's life course, manifesting as relatively stable attitudes and behavioral tendencies toward the world, others, and oneself. It is the external manifestation of the concrete value network differentiated and grown through experience upon the innate value baseline.

Ability, in essence, is the overt efficacy of the "Repertoire" accumulated and formed by Sensation-Behavior Loops successfully achieving Loop Closure. General ability (such as intelligence) reflects the overall level of richness and flexibility of Noetic Stratum Sensation-Behavior Loops; special ability (such as specific skills) embodies the precision, degree of automation, and efficiency of successfully achieving closure of related loops in a specialized domain.

Personality's Unity and Plasticity

Within the framework of the *Sentient Principle*, temperament, character, and ability are no longer three isolated independent dimensions but different facets of a dynamic whole. Personality's fundamental source lies in the unique configuration of Value System Sensation (innate and acquired) and the Repertoire of Sensation-Behavior Loops formed and evolved under this configuration's guidance.

The two exist in continuous interaction: the configuration of Value System Sensation determines in which directions individuals more easily produce intense Sensation Discrepancy, thereby guiding attention and

energy investment, shaping the main directions of Repertoire development; while the successful operation and continuous reinforcement of specific Sensation-Behavior Loops within the Repertoire in turn consolidates and deepens related Acquired Value System Sensation.

Precisely because both Value System Sensation (especially the acquired part) and Repertoire possess experience-based plasticity, Personality's deep structure and external manifestation are not fixed and immutable. This recognition provides fundamental theoretical basis for education, psychological growth, and behavioral change.

III. Cultivating "Sentience"

First-Person Cultivation Methods

Cultivating profound awareness of one's own sentient processes is the core of practice. This includes:

Mindfulness practice: Shifting attentional focus toward Vital Stratum sensations typically in the background, such as breathing rhythm and bodily tension, thereby enhancing awareness clarity of basic Sensation-Behavior Loops.

Emotional awareness: When experiencing emotional disturbance, not merely naming "anger" or "sadness," but deeply identifying the nature of Sensation Discrepancy behind it (positive/negative, intensity, velocity) and related Anticipatory Sensation clarity, transforming vague sensation into clear cognition.

Thinking awareness: Observing the flow of internal Noetic Stra-

tum Sensation-Behavior Loops, identifying whether the deep tension driving thinking stems from Defensive knowledge-seeking, Aggressive expression, or Empathic meaning-seeking, and understanding one's habitual thinking patterns.

Value awareness: When making choices or taking action, exploring the dominant dynamics and background tonality behind them, understanding which level and what nature of Value System Sensation is driving current behavioral direction, thereby more clearly grasping one's value structure.

Third-Person Auxiliary Methods

External observation and measurement can provide important supplementary perspectives for self-understanding:

Physiological indicator measurement: Heart rate, skin electrical response, cortisol levels, and other physiological changes are the bodily-level correlate manifestations of internal Sensation-Behavior Loop activation states. They can reveal background tensions or implicit processes not yet clearly perceived by the subject, but must be cross-referenced and integrated with first-person sensation reports.

Neuroimaging technology: fMRI, EEG, etc., can display brain activity patterns related to specific psychological processes, providing clues for understanding the neural foundation of "Sensation-Behavior Loops," but what they capture are neural correlates, not sensation experience itself.

Behavioral observation: Others' observations of our behavioral patterns (such as "you speak faster every time you face pressure") can reveal habitual "Sensation-Behavior" associations we ourselves fail to perceive, helping identify blind spots.

It must be clarified that all third-person methods reveal "external correlate manifestations" or "shadows" of internal processes; they have suggestive and referential value but cannot replace the ontological status of first-person experience. Only by prudently integrating the two can more holistic self-understanding be achieved.

Conclusion: Return to Life's Self-Understanding

In the vision of the *Sentient Principle*, traditional psychology's core concepts—Behavior, Need, Motivation, Emotion, Memory, Consciousness, Will, Self, Personality—all receive unified reconstruction. They are not mutually independent phenomena but external appearances or descriptive labels presented from different angles and at different levels by the same living sentient system in its dynamic process of sensing and acting.

Their pure essence always lies in: whether Sensation-Behavior Loops are generating, circulating, and achieving Loop Closure; whether Sensation Discrepancy is emerging, driving, and ultimately dissolving.

Therefore, the practice of "becoming a sentient person" is not about obtaining something we originally lacked. It begins with a fundamental recognition: life itself is already sentient. The practice's goal lies in con-

tinuously enhancing our awareness clarity and understanding depth of this internal process, thereby being able to more lucidly observe the context of our own sensation flow, more wisely allocate internal dynamic resources, and exist in a warmer, more resonant manner within the vivid connections with oneself, with others, and with the world.

Appendix Two:

Empirical Foundation and Philosophical Implications of the Sentient Principle

Introduction: Exploration from Shadows to Entity

True advancement in mind science lies not only in the innovation of theoretical paradigms but also requires solid empirical foundations and profound philosophical enlightenment. This appendix will explore three dimensions: first, the empirical foundation of the Sentient Principle and its verification pathways; second, reinterpretation of traditional experimental paradigms based on this principle; third, the philosophical implications contained in the Sentient Principle and its profound significance for understanding human civilization.

I. Empirical Foundation of the Sentient Principle

The Ontological Status of "I Feel..."

The empirical starting point of the Sentient Principle firmly stands upon the ontological priority of "I feel..."—the first-person direct report. Its core empirical principle is: first-person sensation reports are irreducible reality; third-person observation (whether behavioral or neural measurement) can only serve as corroboration and reference; definite internal experience can never be necessarily derived from external indicators.

This position has transformative significance in clinical practice. For example, facing a chronic pain patient whose all instrument examinations show "normal" yet insists on pain, traditional medicine often categorizes this as "psychogenic" pain, implicitly suggesting its "unreality." The Sentient Principle clearly maintains: the patient's "I feel pain" is the direct manifestation of their sentient system, possessing unquestionable ontological status. Medicine's task is not to "falsify" this sensation but to understand the dynamic source of the specific "Sensation-Behavior Loop" supporting this sensation. This requires scientific research to become not only an external measurer but also an empathetic interpreter of internal experience, enabling science to "understand" rather than merely "explain" life.

Empirical Verification of "Sensation Discrepancy"

As the core driving force of the system, Sensation Discrepancy can receive empirical support at multiple levels.

At the neural level, extensive research has confirmed the response pattern of dopamine and other systems to mismatch between Immediate Sensation and Anticipatory Sensation: release increases when results exceed expectations, remains unchanged when matching expectations, and decreases when falling short of expectations. This mismatch response pattern is the direct manifestation of Sensation Discrepancy in neuro-modulatory activity.

At the behavioral level, animal Learning experiments clearly show

that when expected results (such as pressing a lever to obtain food) mismatch with reality, animals exhibit behavioral adjustments such as exploration and trial-and-error. This behavioral change is precisely the manifestation of Sensation Discrepancy driving their "Sensation-Behavior Loop" to update and calibrate.

At the subjective level, human direct experience reports provide the most evidential proof. When expectations ("today everything will go smoothly") seriously mismatch with reality ("results are terrible"), the emerging Emotions of disappointment and confusion are precisely Sensation Discrepancy's vivid presentation in conscious sensation.

Empirical Verification of "Value-Dependent Selection"

As the core mechanism of Learning and adaptation, value-dependent selection likewise possesses solid empirical foundation.

Reinterpretation of classical conditioning is one example. Pavlov's dog producing salivation to a bell sound after repeated pairing with food—traditional theory views this as "stimulus-response" association. The Sentient Principle reveals this is essentially a new "Sensation-Behavior Loop" (bell sound → expect food → salivation) that, because it can reliably predict an event with innate value (food), is thereby selectively consolidated under positive value evaluation's modulation.

Operant conditioning is likewise so. A rat in a Skinner box Learning to press a lever to obtain food is not simple "behavior-result" reinforcement, but the "pressing-obtaining" Sensation-Behavior Loop that,

because it can effectively relieve hunger (satisfying Innate Value System Sensation), is thereby value-dependently selected and consolidated.

Human skill Learning (such as playing piano) likewise follows this logic. Practice's essence is not mechanical repetition of movements but the coordination of visual, auditory, and motor sensation in a "Sensation-Behavior Loop" that, under the guidance of pursuing harmony and accuracy (a Noetic Stratum Value System Sensation), achieves refinement and consolidation through countless successful Loop Closures (expectation matching result). Neuroscience has confirmed that Value System Sensation (such as through dopamine, acetylcholine, etc.) can broadly modulate Hebbian Plasticity, thereby providing biological foundation for value-dependent selection.

Cross-Level Verification of "Resonance-Evaluation-Consolidation"

"Resonance-Evaluation-Consolidation" as the unified generative logic running through different organizational levels has its effectiveness confirmed at multiple scales.

At the unicellular life level, bacterial "quorum sensing" displays the most primitive form: when population density reaches a critical threshold through chemical signals (Resonance), it coordinately triggers Behaviors such as bioluminescence; such coordination, because it confers significant survival advantages (evaluation), is consolidated through natural selection into genes.

At the neural level, neuronal ensembles achieve temporary functional Resonance through synchronized firing; if this activity pattern can lead to adaptive perceptual or behavioral output (evaluation), then related neural connections are consolidated through plasticity mechanisms, forming stable functional ensembles.

At the social level, the formation and transmission of cultural traditions is a typical example. Group members through imitation and Learning form shared language, customs, and other "Sensation-Behavior" patterns (Resonance). These patterns, because they can bring belonging, security, and social identity (strong social value evaluation), are transmitted generation after generation, consolidating as cultural foundations.

At the cognitive level, the acceptance of scientific theories and paradigm shifts are likewise so. A "Thought Meme" (such as a new scientific theory), if it can produce profound Resonance with individuals' and communities' cognitive structures and can more effectively eliminate cognitive uncertainty and explain more phenomena (obtaining Noetic Stratum positive evaluation), will be widely accepted and disseminated, consolidating as the dominant paradigm of a period.

This cross-level unity—following the same logic from microscopic to macroscopic, from life to civilization—constitutes the core of the Sentient Principle's powerful explanatory power and theoretical appeal.

II. Reinterpretation of Traditional Experimental Paradigms

Traditional behaviorism depicts "Reflex" as a direct, necessary causal connection between stimulus and response. The Sentient Principle provides a fundamental reinterpretation: Reflex is the shortest, most solid, highly consolidated link in the "Sensation-Behavior Loop."

Traditional operant conditioning theory views "reinforcement" as key to shaping Behavior: reward increases behavioral frequency, punishment decreases it. The Sentient Principle indicates that so-called "reinforcement" is essentially a manifestation of the more universal mechanism of "value-dependent selection."

Traditional cognitive science often metaphorizes Memory as "encoding, storage, and retrieval of information." The Sentient Principle conducts a thorough dynamic reconstruction of this: Memory is the consolidation of "Sensation-Behavior Traces," while recall is creative "re-sensation" of traces in the present.

This leads to Edelman's core concept "The Remembered Present." Our every moment's experience is not the "pure present" but rather a unified sentient field continuously generated through large-scale "Reentry" mechanisms that compare and integrate re-sensation of past traces, Immediate Sensation of the present moment, and Anticipatory Sensation of the future. Memory is thereby understood as a dynamic, constructive life process.

III. Philosophical Implications of the Sentient Principle

The Ontological Revolution of the First Person

The Sentient Principle achieves a fundamental shift in philosophical stance: from depending on third-person "objective" observation, returning to ontological commitment to the first-person direct experience of "I feel..." "I feel" is not a secondary phenomenon requiring external evidence for confirmation or dissolution, but the most primitive, most genuine report of a living system's self-state, possessing ontological priority.

From "Life Metaphor" to "Life Integration"

The Sentient Principle firmly adopts "life" itself as the fundamental metaphor for understanding mind, rejecting "mechanical" or "computational" metaphors. Mind is not some "software" or "function" loaded onto organisms, but the mode of presentation of life dynamically existing as a sensing process.

This stance brings powerful explanatory unity. From the most basic pain Reflex to complex social cooperation to abstract scientific theories and artistic creation, all can be coherently understood within the unified dynamic framework of "Sensation-Behavior Loop," Sensation Discrepancy, and value-dependent selection. It breaks down artificial disciplinary barriers among physiology, psychology, sociology, and philosophy, depicting a continuously unified life landscape from microscopic neural

activity to macroscopic civilizational phenomena, providing common conceptual foundation for genuine interdisciplinary dialogue.

The Practical Path of Becoming a "Sentient Person"

The ultimate concern of the Sentient Principle is guiding individuals to become more complete, more lucid "sentient persons"—deep perceivers, wise regulators, and warm resonators of their own life processes.

This first requires continuous self-awareness: through introspection and practice, bringing those Value System Sensations and Sensation-Behavior Loops in background or implicit states into clear awareness domains, understanding the deep dynamic map of one's own Behavior.

Furthermore, conducting active regulation on this foundation. Understanding Sensation Discrepancy's driving effect, value-dependent selection's shaping power, and the dynamic interaction of dominant dynamics and background tonality enables us to be no longer passive receivers of our own sensation flow, but "helmsmen" who can more consciously guide attention, allocate resources, and shape habits.

Ultimately, this leads toward warm acceptance and profound Resonance with others' lives. Understanding others means using one's own Sensation-Behavior experience to simulate and sense the possible states of the other's system. When facing an accusation like "I feel you are very selfish," being able first to view it as a precious system state report, thereby opening inquiry: "In which moments did you generate such sensation?" This transforms potential conflict into joint exploration and un-

derstanding of dynamic patterns between two independent sensation systems.

Holistic Integration: Unity of Science, Art, and Faith

Historically, many profound souls have displayed a boundary-crossing wholeness: Einstein embodied scientist, musician, and philosophical thinker; Newton simultaneously explored natural laws and theology; Schrödinger drew inspiration from Indian philosophy. This is not coincidental but the manifestation of the "sentient person's" essence: life's unity in sensation necessarily requires wholeness in the way of understanding the world.

From the Sentient Principle's perspective, science, art, and religious faith are not fragmented domains but the unfolding of unified life processes in different dimensions: Science is the exploration and systematic understanding of "Sensation-Behavior Loops" operational patterns in the objective world. Art is the direct sensation and creative expression of Sensation Discrepancy's flux beauty and internal value tensions. Faith provides ultimate meaning frameworks and value anchor points for individuals' and groups' "Sensation-Behavior Loops."

Modern education's predicament often lies in artificially fragmenting this wholeness, making science education alienated from subjective experience, art education marginalized, and value exploration viewed as irrational. The Sentient Principle calls for education returning to wholeness: letting science cultivate reverence and curiosity, letting art awaken

sensation and creation, letting value education help establish meaning foundations. Only thus can we cultivate complete persons who can both understand world patterns, sense its beauty, and settle their own existence.

The Civilizational Vision of "Sentient Ecology" and Historical Warning

The Sentient Principle envisions a "Sentient Ecology" based on deep understanding and Resonance. Within it, epistemology's starting point shifts from isolated "I think" to co-present "I feel"; understanding others becomes Resonance practice of using one's own experience to simulate others' system states. Social interaction shifts from zero-sum competition to symbiotic cooperation; civilizational structure shifts from power pyramids to multi-level Resonance circles.

Nazi Germany's history provides a heavy counter-example for this. It displays the systemic cancer triggered when the Social Stratum "Defensive" tension (manifested as pursuit of group belonging) was distortedly anchored to extreme exclusivist racial definition. That system, by rigidifying "us" boundaries and absolutely concretizing "enemies," achieved efficient "Loop Closure" through persecution and war in the short term, bringing distorted belonging and (false) security to many citizens, eliminating the collective Sensation Discrepancy brought by defeat.

However, from the Sentient Principle's perspective, this was by no

means healthy adaptation but system closure and entropy increase. It built the permeable sensation boundaries upon which life depends into isolating high walls, refusing value and emotional exchange with the broader human community. Its ultimate collapse was not only military defeat but the inevitable result of this closed system's dynamics: internally suppressed Sensation Discrepancy continuously accumulated until the system could no longer bear it. The postwar establishment of international governance systems can be viewed as humanity's larger living system conducting necessary "immune response" and "closed loop reconstruction" against the cancerous subsystem—a difficult attempt to substantially expand "Defensive's" applicable scope at legal and value levels.

This historical lesson warns us: any collective closed loop built upon exclusivist identity, however powerful in the short term, will ultimately meet reckoning in the grander logic of life and civilization. A true "Sentient Ecology" requires individuals and collectives to always maintain permeability of sensation boundaries, maintain courage to remain open to broader systems, and seek wisdom of coexistence through Resonance.

Conclusion: Let Science Embrace Life

The Sentient Principle is not only a theoretical system but also a scientific manifesto full of humanistic care. It marks a turning point in mind research: from "cognitive science" attempting to reduce humans to

algorithms or reaction collections while stripping context, returning to "life science" centered on vivid life experience while embracing completeness.

It begins with solemn listening to the plain expression "I feel..." and ultimately guides us on how to become lucid perceivers and wise regulators of our own life flow, and in profound Resonance with others' lives, jointly move toward a warmer, more whole, and more open world that more "sentient persons" can sense.

From neurons' synchronized firing to thought's brilliant radiance to civilization's magnificent architecture, resonating behind them is the same profound and warm rhythm—life, through the eternal weaving of sensation's flow and Behavior's arrow, under value's guidance, continuously weaving larger, more coordinated, more creative Resonance nets, moving toward deeper connection, understanding, and coexistence.

The Sentient Principle ultimately invites us to complete a fundamental turning, to deeply embrace that ever-present entity sensing and acting—life itself.

Appendix Three:

Sources of Thought

Introduction: Stripping Away Appearances, Returning to Essence

"Strip away the various differences in superficial expression, return to the most essential thing."

Reviewing the intellectual lineage of the *Sentient Principle*, a profound phenomenon emerges: scholars from different eras, using vastly different terminology, have described seemingly identical core phenomena. From Robert Whytt (1751)'s "Sentient Principle" and "uneasy sensation," to Ivan Sechenov (1860s)'s "regulator" and "abnormality," to Gerald Edelman (1970s)'s "Neural Darwinism" and "Value-Dependent Selective Stabilization," the terminological differences are so great that one might almost doubt whether they are exploring the same subject.

However, when we strip away terminological and expressive superficial differences and return to the most essential level, we discover: they all knock on the same fundamental question—how does life drive Behavior through sensation, and how does it regulate sensation through Behavior, thereby achieving self-maintenance and adaptive growth.

This appendix's purpose is not to write a detailed intellectual history, but to trace the deep intellectual lineage of the *Sentient Principle* along the thread of "inspiration, reference, Resonance." Through systematic, historical, and dialectical perspectives, organizing predecessors' out-

standing contributions, thereby more clearly manifesting the core values and significance upheld by the *Sentient Principle* under the reflection of the long river of thought.

I. Origins and Foundations of Thought

Robert Whytt (1751): The Forgotten Source

Core Thought

Scottish physician and physiologist Robert Whytt (1714-1766), in his 1751 work *An Essay on the Vital and other Involuntary Motions of Animals*, first explicitly proposed the concept of "Sentient Principle." His core thesis states: "The structure of our bodies is so constituted that the sentient principle is determined by uneasy sensations to produce such motions or changes in the body as naturally tend to remove or diminish those sensations."

This thesis contains several key elements: "Sentient Principle" refers to an inherent life capacity for sensation that is neither soul nor pure reason. "Uneasy sensation" is an internal, driving sensational state. "Is determined" indicates this drive is automatic and necessary. "Naturally tend to remove or diminish" reveals Behavior's inherent purposiveness—eliminating unease. "So constituted" indicates this is a fundamental principle of life's construction.

Whytt used stomach peristalsis and pupil constriction as examples to explain this principle. He especially pointed out: "Although this sensation may be less perceptible in smaller changes, yet may be sufficient

to excite" Behavior—this already vaguely touches upon the existence of "background awareness."

Discourse Structure and Terminological Evolution

Whytt's discourse demonstrates a clear structure from simple to complex: from basic vital motions such as heart contraction, breathing, and digestion, to sensory organ responses such as pupil and eyelid, finally discussing voluntary motion. This structure not only has pedagogical significance but also implies evolutionary and generative logic of life functions from foundational to advanced.

Terminologically, Whytt, limited by his era, still used the term "mind," but his discourse substance was already very close to modern understanding. He emphasized a "sentient intelligent principle," regarding it as the source of life, sensation, and motion, operating through the nervous system, while humbly acknowledging that one should not presume to speculate about its properties. This laid the groundwork for transitioning from "mind"—a term laden with metaphysical coloring—toward the more neutral, fundamental concept of "sentient."

Significance for the Sentient Principle

The *Sentient Principle*'s name directly derives from Whytt's "Sentient Principle," but achieves important conceptual advancement: adopting the more neutral "sentient," returning to the more fundamental "sensation," extending to all life, while clarifying the ontological priority of first-person experience. His "uneasy sensation" and complete "sensation-

behavior" causal chain respectively foreshadow the core mechanisms of "Sensation Discrepancy" and "Sensation-Behavior Loop." His demonstrated paradigm of discourse from simple to complex also provides an exemplar for theory systematization.

However, with the rise of experimental physiology in early 19th century (represented by Magendie), the research paradigm emphasizing third-person observable facts became mainstream; Whytt's approach based on first-person philosophical speculation was gradually marginalized until being rediscovered and reactivated by the *Sentient Principle*. This journey itself constitutes a dialectical "thesis-antithesis-synthesis": from Whytt's first-person speculation (thesis), to Magendie and others' third-person experimentalism (antithesis), ultimately moving toward the synthetic understanding advocated by the *Sentient Principle*—founded on first-person ontological priority while integrating third-person corroboration (synthesis).

Ivan Sechenov (1860s-1889): Foundation of the Russian Tradition

Core Contribution: Classification of Sensations and Regulatory Mechanisms

As the founder of the Russian physiological tradition, Ivan Sechenov systematically expounded the concept of "regulator" in 1889 and proposed an extremely insightful sensation classification system. He viewed sensations as "signal components of regulators," whose function

is: when some part of a living organism's state exhibits "abnormality," it can trigger corresponding activities (motor or secretory) to eliminate that abnormality.

He classified sensations into four categories: *Local regulators*, such as sneezing, pupil constriction, nearly mechanical and unconscious, aimed at ensuring bodily local integrity. *Systemic feelings*, such as hunger, thirst, sexual desire, fatigue, and a vague "general sense of well-being/discomfort." Sechenov explicitly pointed out that specific desires (such as hunger) "stand out" from this general sensation "background" and disappear with satisfaction. Such sensations serve the entire organism and its surface integrity. *Muscle sensation (proprioception)*, a vague but crucial sensation accompanying all muscle movements, foundational for coordinating movement and spatial-temporal orientation. Pain also belongs to this category, directly driving Behavior to remove harmful sources. *Higher sensory organs*, such as vision, hearing, touch, possess high discriminative power and objective directionality, being the primary tools for organism-external world interaction. He especially noted that these signals often do not directly trigger motion, existing in a "background" state.

A key insight of Sechenov was distinguishing the "driving effect" of Systemic Feelings (such as hunger making an animal rise to search) from the "guiding effect" of higher sensations (such as vision guiding search direction and method).

Significance for the Sentient Principle

Sechenov's work produced strong "Resonance" with and provided important "inspiration" for the *Sentient Principle*. His "regulator" concept itself is already a complete feedback loop model. His four-category sensation division, particularly his depiction of "Systemic Feelings" and their background/focus dynamics, provides a classical framework for understanding Value System Sensations at different levels and their visibility relationships. His emphasized "abnormality driving adaptive activity" and "eliminating abnormality" almost directly correspond to the driving of "Sensation Discrepancy" and the Goal of "Loop Closure."

From Whytt (1751) to Sechenov (1889), spanning Magendie's experimental physiology revolution in between. Magendie, through experiments separating sensory and motor nerve roots, pushed research toward precise mechanism exploration. Sechenov, absorbing experimental achievements, re-integrated and deepened understanding of sensation's regulatory function. This century-plus developmental trajectory clearly indicates: despite terminological and paradigmatic iterations—from Whytt's philosophical speculation to Magendie's experimental analysis to Sechenov's systematic synthesis—the exploration's core always revolves around sensation's fundamental role in guiding life's Behavior. Sechenov may not have directly known Whytt's work, but he independently touched the same essence and made more systematized, more physiologically detailed developments.

This cross-era correspondence is no coincidence; it reveals that in

the quest for life's essence, the most profound insights often point in the same direction.

II. Transcending Surface Opposition

Historical Echo: The Dispute Between "Reflex Arc" and "Reflex Ring"

In Sechenov's (1860s-1889) thought, "reflex arc" and "reflex ring" were originally one: his "regulator" concept (sensation → abnormality → adaptive activity → eliminating abnormality → new sensation) itself constituted a closed loop. He both affirmed this ring process's integrity and viewed the reflex arc as its important segment—the latter being indispensable in experimental research on isolated nerves and muscles. Therefore, within his theoretical framework, the two were not opposed.

However, by the 1930s in Soviet Russian physiological circles, this evolved into a factional dispute between "reflex ring" and "reflex arc." Bernstein emphasized "sensation correction," advocating the reflex ring paradigm; while within the Pavlovian school, represented by Anokhin, theoretical improvements were made by introducing the concept of "returning afference." Meanwhile, other work in the Pavlovian school continued enriching experimental research on various conditioned Reflexes.

The New Battlefield of the Century: The Dispute Between "Activity" and "Reactivity"

Entering the 21st century, the systemic psychophysiological school derived from Anokhin's school further proposed the paradigm dispute

between "activity" and "reactivity." Notably, their critical target mainly pointed toward Descartes (viewed as the progenitor of the "reactive school"), yet avoided discussing Pavlov, the zenith representative of the reactivity paradigm.

The systemic psychophysiological school summarized and criticized the Cartesian paradigm as follows: It is a mechanism viewing Behavior as a unidirectional, passive "stimulus → response" process; it views animals as "living mechanical machines," their suffering analogized to "the squeaking of an unlubricated machine." Its core viewpoint is: life is passive, Behavior is merely reaction to stimulus.

In contrast, the systemic psychophysiological school proposed the "activity" paradigm: life is not passively reactive but proactive; Behavior is purposive and future-oriented; there exists so-called "anticipatory reflection"—life does not react to the past but prepares for the future. They maintain that at all levels and stages of life, the "activity" perspective should be adopted.

Surface Opposition and Essential Complicity

These two paradigms appear diametrically opposed on the surface: one emphasizes passivity, mechanism, determination by the past; the other emphasizes proactivity, feedback, guidance by the future. However, in the view of the *Sentient Principle*, they actually form "complicity" on the same fundamental defect: they both imprison and replace the researched's subjectivity with the researcher's subjectivity.

Whether "reactivity" or "activity" paradigm, both commit the same errors:

1. **Depriving freedom, creating "behavioral desert":** Whether fixing dogs on Pavlov's stand or placing rabbits in Skinner boxes with only pedal-pressing and ring-pulling options, experimental environments are extremely simplified, depriving life of natural, rich possibilities for Sensation-Behavior Loops.

2. **Artificially manufacturing "Needs":** Behavior is either driven by external stimuli (reactivity) or induced through artificially created hunger (activity). When animals are in natural satiated states, the "laws" discovered by these paradigms immediately fail. This indicates they study not life's natural existence state, but "how life adapts to extremely simplified environments under artificially created deprivation."

3. **Researcher decides everything:** From defining what constitutes "stimulus" and "response" to setting what constitutes "Need," "Goal," "success," and even "behavioral options," the researcher's subjective design completely frames the researched's behavioral world; its own internal sensation and choice are utterly ignored.

4. **Ignoring fundamental driving level:** Neither touches "why life must behave" fundamentally. Reactivity's answer is "external stimulus," activity's answer is "internal Goal" (though artificial). The true answer lies in first-person Sensation Discrepancy—the recognizable imbalance between Immediate Sensation and Anticipatory Sensation. This is precisely the internal life driving force jointly overlooked by both.

5. Adhering to third-person perspective: Both start from external observation (observing stimuli, responses, neural signals, feedback, or "anticipatory reflection"); both exclude first-person direct sensation experience from research's core domain.

The Sentient Principle's True Transcendence: Returning to Sensation's Essence

The *Sentient Principle* does not choose between "reactivity" and "activity" but fundamentally transcends this opposition, returning to life's essence as sensing process.

1. Transcending binary opposition: Life is neither purely passive nor purely active; life exists in sensing. Sensation is both acceptance of the present and contains expectation of the future; this artificial distinction itself is unnecessary. Starting from first-person experience, the "reactivity" versus "activity" debate is a false proposition; both miss life's sensing essence by being imprisoned in third-person perspective.

2. Returning to fundamental dynamics: The *Sentient Principle* clearly indicates: what drives Behavior is neither "stimulus-response" nor "goal-behavior" but the sentient loop of Sensation Discrepancy-Behavior-new sensation. Sensation Discrepancy is a first-person sensory event, life's internal fundamental driving force.

3. Methodological revolution: Its methodology is based on three principles: No deprivation (not driving through artificial deprivation, studying complete Sensation-Behavior Loops in natural contexts); No

imprisonment (not presetting Goals, not limiting behavioral options, letting life itself manifest its loop); No dogmatism (not replacing internal experience with external observation, insisting on first-person sensation report's ontological priority, using third-person data only as corroboration).

4. Fundamental perspective shift: This marks the fundamental perspective shift from "reactivity" (third-person, external stimulus, imprisoned observation) and "activity" (third-person, internal artificial Goal, imprisoned observation) to "sentience" (first-person, Sensation Discrepancy, respecting essence). The *Sentient Principle* starts from life's own first-person sensation, aiming to answer the "what" and "why" of driving force—what is Sensation Discrepancy? Why does it exist? This driving force stems from life's own internal standards, not any "stimulus" or "Goal" defined by external observers.

III. Deepening and Extension

Gerald Edelman (1970s-2014): Selection and Integration

Core Thought: Neural Darwinism

American neuroscientist and Nobel laureate Gerald Edelman proposed the theory of "Neural Darwinism" in the 1970s. This theory holds that brain function formation follows a selectionist logic, its core containing three key processes: developmental selection (forming diversified anatomical connections through epigenesis during development, i.e., primary Repertoire); experiential selection (behavioral experience con-

tinuously adjusting synaptic connection strength, selectively strengthening neuronal group secondary Repertoires related to adaptive Behavior); and "Reentry" (continuous parallel signal exchange among different brain regions to maintain spatiotemporal continuity and integrity of responses to the real world).

Value-Dependent Selection: Core Contribution

Edelman explicitly defined the value system as a series of neural modulatory systems with diffuse projection characteristics (such as cholinergic, noradrenergic systems, etc.). These systems can respond to evolutionarily or experientially salient cues, broadcast their responses to wide brain areas, and regulate synaptic strength changes through releasing specific substances.

He further distinguished two types of value: innate value and acquired value. Innate value, through evolutionary selection and epigenetic formation in development, is closely related to protective Reflexes, consumptive activities, and homeostatic Needs (such as hunger, thirst, pain). Acquired value is selected through value-dependent synaptic changes during an individual's lifetime, manifested as originally neutral neural or behavioral events acquiring value because they can predict innate value events.

Edelman's core contribution lies in revealing that "value itself is adaptive." The value-dependent Learning mechanism applies not only to sensory-motor mapping but also to the value system's own afferent con-

nections. This enables value judgment standards to become adaptive during an individual's life course, becoming a recursive, self-regulating process: the value system regulates synaptic selection in other brain regions, while its own input pathways are continuously regulated according to experience.

Significance for the Sentient Principle

Edelman's work provides profound inspiration for the *Sentient Principle* from the neural mechanism level. His thoughts on selection, diversity, epigenetic development, and integration lay scientific foundation for understanding the formation and reinforcement of Sensation-Behavior Traces. Particularly the insight that "value itself is adaptive" is an important foundation for the *Sentient Principle*'s core viewpoint: Value System Sensation is not fixed but plastic; the sensation standards of "good" and "bad" can flux and grow through experience.

Their relationship manifests as complementarity and transcendence of perspectives. Edelman primarily describes "how" the value system works from the third-person neuroscientific perspective. The *Sentient Principle* starts from first-person sensation experience, aiming to explain "what" Value System Sensation is and "why" it is the core of life's dynamics. Neural mechanisms constitute the material foundation of the sensing process, while sensation experience is that process's direct essential manifestation.

Pavel Simonov (1960s-2002): Emotion and Empathy

Life Journey and Theoretical Warmth

The life journey of Soviet famous emotional physiologist Pavel Simonov infused his theory with unique humanistic warmth and profound experience. His early family adversity and received assistance gave him firsthand understanding of suffering, empathy, and altruism; this life's texture also flows through his academic thought.

Core Theoretical Contributions

Simonov's theoretical contributions mainly include:

Need-Emotion theory: Maintains Emotion originates from Need and reflects Need's satisfaction state.

Three-layer structure of Needs: Explicitly proposed Needs exist at Vital Stratum, Social Stratum, and Noetic Stratum—this layering thought has far-reaching influence.

Biological foundation of empathic Need: He originally argued that empathy is not a purely acquired higher psychological function but a basic Need with biological foundation.

Altruistic Need as evolutionary outcome: Views altruistic Behavior itself as an internal Need that can bring pleasant satisfaction.

Integration of science and art: Simonov deeply studied the Stanislavsky performance system, discovering actors can achieve sincere performance only by activating their own authentic Emotional Memory (first-person "I am" state). This practically confirms Emotion's unforge-

able essence as first-person sensation experience and the profound unity science, art, and philosophy can achieve in exploring human sensation.

Significance for the Sentient Principle

Simonov's thinking brings important inspiration and strong Resonance to the *Sentient Principle*. He positioned empathy and altruism at the biological height of basic Needs, greatly expanding the scope of Value System Sensation, enabling us to understand why witnessing others' suffering triggers one's own genuine negative sensation and drives altruistic Behavior. His "Need" concept is profoundly related to the *Sentient Principle's* Sensation Discrepancy, while his exploration of Emotion is more precisely defined by the latter as the combination of Sensation Discrepancy and Anticipatory Sensation clarity.

Most importantly, Simonov highlighted the irreplaceability of "first-person perspective" through art research, completely aligning with the *Sentient Principle's* core stance of placing first-person sensation at ontological priority. His work itself also demonstrates theoretical thought can originate from profound life experience and contain humanity's warmth within scientific rigor, achieving fusion of scientific, artistic, and philosophical visions.

Yuri Simonov (Vyazemsky) (2000s-): Methodological Framework

Core Thought Contributions

As Pavel Simonov's son, Yuri Simonov (Vyazemsky) developed a

thinking method emphasizing systemicity, dialectics, and historicity. He inherited and expanded his father's "Need triad," proposing a two-dimensional dynamic classification framework: with Vital Stratum, Social Stratum, Noetic Stratum as one dimension, and Defensive (extraversion), Aggressive (introversion), Empathy (chronoversion) as another dimension, thereby constituting a matrix containing nine basic dynamic categories. He simultaneously advocates that science, art, and religion/philosophy should mutually reference and integrate in humanity's efforts to understand the world and Self.

Significance for the Sentient Principle

Vyazemsky's "three-dimensional dynamic classification" framework provides direct and important reference for the *Sentient Principle's* Three Layers, Nine Categories structure. The systematic, dialectical, historical thinking method he advocates, as well as the concept of integrating different cognitive pathways, also produce strong Resonance with the *Sentient Principle's* scholarly temperament.

From Pavel Simonov's "Need triad" to Vyazemsky's static "three-dimensional dynamic classification" to the *Sentient Principle's* three-dimensional dynamic structure, a clear chain of thought inheritance and development forms. The *Sentient Principle* achieves crucial theoretical advancement on this foundation: it transforms this structure from a static "room" model into a dynamic flux, process-filled descriptive system; simultaneously, it traces the theory's starting point to unicellular organ-

isms' sensing and coordination, thereby gaining more profound universality and essentiality for the entire framework.

IV. Synthesis and Transcendence

Stripping Away Appearances, Returning to Essence

Surveying this intellectual journey spanning over 270 years, various theories present diverse appearances: from 18th-century Whytt's philosophical language to 19th-century Sechenov's physiological language to 20th-century onward cognitive psychological and neuroscientific language; from "Sentient Principle," "regulator," "sensation correction," "returning afference" to "Neural Darwinism," "Need-Emotion theory," "three-dimensional dynamics," and other varied terminology.

However, when we penetrate these terminological and epochal superficial differences, we discover their profound unity at five fundamental levels:

1. **Sensation is fundamental.** Whether Whytt's "Sentient Principle," Sechenov's "Systemic Feelings," Edelman's "evaluation" (essentially sensation), Simonov's "Need" (essentially sensation), or the *Sentient Principle's* explicit focus on "sensation," all place sentience at the center of understanding life.

2. **Imbalance is the driving force.** An internal, sensible tension change—whether Whytt's "uneasy sensation," Sechenov's "abnormality," Edelman's "negative evaluation," Simonov's "unsatisfied Need," or the *Sentient Principle's* precisely defined "Sensation Discrepancy"—all of

these are consistently viewed as the fundamental driving force for behavioral change.

3. Behavior's purpose is to eliminate this imbalance. From Whytt's "naturally tend to remove or diminish," Sechenov's "eliminating abnormality," Edelman's "selecting effective neuronal groups," Simonov's "satisfying Need," to the *Sentient Principle's* "eliminating Sensation Discrepancy" and achieving "Loop Closure," Behavior is understood as an adaptive process aimed at restoring internal balance.

4. Complete feedback loop is the core mechanism. From Whytt, Sechenov, Edelman to Simonov, despite different expressions, all touch upon life process as a circular structure containing sensation, comparison, action, and result evaluation.

5. This is life's essential attribute. The above principles are universally viewed as fundamental principles of life organization, whether Whytt's "constitution," Sechenov's basic life mechanism, Edelman's neural system fundamental principle, Simonov's Need's biological foundation, or the life essence expounded by the *Sentient Principle*.

Therefore, numerous theories are essentially identical, with differences mainly in expression methods and exploration perspectives.

The Sentient Principle's Inheritance, Development, and Transcendence

The *Sentient Principle* is deeply rooted in this intellectual tradition and conducts systematic inheritance, development, and transcendence on

this foundation.

Its inheritance manifests in absorbing and integrating predecessors' core insights: Whytt provided thought's origin and basic loop model; Sechenov contributed the regulator concept and preliminary sensation classification system, touching upon background and focal awareness prototypes; Bernstein provided empirical evidence for sensation correction; Anokhin advanced systematized thinking on functional systems; Edelman established the neuroscientific framework of selection mechanisms, epigenetic development, and value-dependent Learning; Simonov expanded empathy and altruism's biological Need foundation and highlighted first-person experience's irreducibility through art research; Vyazemsky provided the three-dimensional dynamic classification framework and systematic dialectical thinking methods.

Upon inheritance, the *Sentient Principle* conducts significant development: it constructs a more systematized complete theoretical system (such as Three-Layer Structure, precise definition of multiple sensation types, trace mechanisms); achieves concept precision (such as "Sensation Discrepancy" being more operational than "uneasy sensation"); extends explanatory scope from unicellular life to human civilization; and deepens at multiple levels, such as emphasizing Value System Sensation's fundamentality, clarifying proprioception's positioning function, elucidating the dynamic relationship between background and focal awareness.

True transcendence manifests in the following fundamental shifts

and deepenings:

1. Perspectival revolution from third-person to first-person.

Predecessors mostly started from external observation (stimulus-response, neural conduction); the *Sentient Principle* firmly stands upon first-person sensation experience and establishes its ontological priority, explicitly stating sensation cannot be reduced to neural activity.

2. Level leap from describing mechanisms to explicating essence.

Predecessors mainly described "how" it works; the *Sentient Principle* aims to explain "what" and "why" of driving force, viewing neural mechanisms as foundation while viewing sensation's essence as the purpose of understanding life.

3. Paradigm shift from external adaptation standards to internal balance standards. Predecessors often used external standards like "adaptation," "survival"; the *Sentient Principle* adopts "eliminating Sensation Discrepancy"—life's internal, sensory standard—as the fundamental basis for measuring behavioral effectiveness.

4. Theoretical integration from local analysis to holistic understanding. Predecessors mostly focused on specific localities (motion, Emotion, Need); the *Sentient Principle* provides a holistic understanding framework running through Vital Stratum, Social Stratum, Noetic Stratum.

5. Conceptual evolution from static classification to dynamic flux. Upon Vyazemsky's static "nine rooms" classification foundation, the *Sentient Principle* injects the "dynamic flux" dimension, viewing

Three Layers, Nine Categories as a continuously interacting, transforming, and growing process within a dynamic field.

6. **Tracing from higher animals to life's origin.** Lowering theory's starting point to unicellular organisms' sensing and coordination enables theory to gain more universal applicability and more profound essentiality.

Conclusion: Thought's Inheritance and Innovation

"Strip away the various differences in superficial expression, return to the most essential thing."

From Robert Whytt to the *Sentient Principle*, this intellectual lineage spanning over 270 years witnesses the transformation of terminology, language, and epochs, yet its exploration's core remains consistent. True innovation is not terminological renovation but more profound grasp of essence and more systematic presentation.

The *Sentient Principle* stands on these giants' shoulders; its innovation manifests in: clarifying first-person sensation experience's ontological priority; establishing Sensation Discrepancy's core position as life's fundamental driving force; revealing "eliminating Sensation Discrepancy" as Behavior's internal purpose's universality; and ultimately constructing a complete theoretical system starting from life's origin, running through all levels, integrating dynamics and processuality.

Organizing intellectual lineage's value lies in restoring historical

truth, penetrating terminological fog to grasp essence, clarifying different research perspectives' boundaries and values, understanding thought's inheritance genealogy, and thereby identifying where true innovation lies. The *Sentient Principle* is precisely this intellectual tradition's contemporary deepening and crystallization—it is both a tribute to history and a new, systematic theoretical construction toward life's essence.

References

- Whytt, R. (1751). *An Essay on the Vital and Other Involuntary Motions of Animals*. Hamilton, Balfour, and Neill.
- Бернштейн, Н. А. (1947). *О построении движений*. Москва: Медгиз.
- Сеченов, И. М. (1952). *Избранные произведения, Т. 1: Физиология и психология*. Москва: Издательство Академии Наук СССР.
- Бернштейн, Н. А. (1966). *Очерки по физиологии движений и физиологии активности*. Москва: Медицина.
- Анохин, П. К. (1968). *Биология и нейрофизиология условного рефлекса*. Москва: Медицина.
- Феигенберг, И. М. (1972). *Мозг, психика, здоровье*. Москва: Наука.
- Edelman, G. M. (1987). *Neural Darwinism: The Theory of Neuronal Group Selection*. New York: Basic Books.
- Edelman, G. M. (1989). *The Remembered Present: A Biological Theory of Consciousness*. New York: Basic Books.
- Friston, K. J., Tononi, G., Reeke, G. N., Sporns, O., & Edelman, G. M. (1994). *Value-dependent selection in the brain: Simulation in a synthetic neural model*. *Neuroscience*, 59(2), 229–243.
- Симонов, П. В. (1998). *Лекции о работе головного мозга: Потребностно-информационная теория высшей нервной деятельности*. Москва: Институт психологии РАН.
- Krichmar, J. L., Edelman, G.M. (2002) *Machine Psychology: Autonomous Behavior, Perceptual Categorization and Conditioning in a*

Brain-Based Device, Cerebral Cortex 12: 818-830.

Александров, Ю. И. (2022). *Психофизиология: Учебник для вузов (5-е изд., перераб. и дополн.)*. СПб.: Питер. (сс. 290–345)

Вяземский, Ю. П. (2022). *Вооружение Одиссея: Философское путешествие в мир эволюционной антропологии*. Москва: МИО-БУКС.