Article

Not peer-reviewed version

The Proximal Chemical Mandate Principle: A Framework for Invariant Biological Dynamic Optimization

Mukundan M *

Posted Date: 17 November 2025

doi: 10.20944/preprints202511.1254.v1

Keywords: Proximal Chemical Mandate; neurochemical optimization; reward maximization; stress minimization; behavioral motivation; consciousness studies; determinism; evolutionary psychology; adaptive behavior; maladaptive behavior

Article

The Proximal Chemical Mandate Principle: A Framework for Invariant Biological Dynamic Optimization

Mukundan M

Independent Researcher; mukundanmuthukumar@gmail.com

Abstract

This paper presents the Proximal Chemical Mandate Principle, a theoretical framework proposing that behavior in organisms with neurochemical systems is governed by two invariant mandates: reward signal maximization (R↑) and stress signal minimization (S↓). We develop a three-tiered hierarchy where proximal chemical drivers (Px) implement evolved functional objectives (Xm) through object selection criteria (OsC) detected by identifier sensors (I-s), producing ultimate outcomes (Uo) that are environmentally contingent. The framework identifies three environmental domains—Natural Selection Field, Natural Epistemophilia Field, and Natural Counterproductive Field—where identical neurochemical optimization processes yield adaptive, mixed, or maladaptive outcomes respectively. We integrate evidence from neuroscience and propose conceptual thought experiments to test necessary and sufficient conditions of the mandates. The model suggests consciousness functions as a state reflection of ongoing neurochemical computations rather than as a causal agent, with philosophical implications for understanding agency and decision-making. The framework provides a unified account of behaviors ranging from basic survival to complex cognitive processes through deterministic neurochemical optimization principles.

Keywords: Proximal Chemical Mandate; neurochemical optimization; reward maximization; stress minimization; behavioral motivation; consciousness studies; determinism; evolutionary psychology; adaptive behavior; maladaptive behavior

---

1. Introduction

Understanding the fundamental drivers of human behavior remains a central challenge across neuroscience, psychology, and evolutionary biology. Current research often fragments behavioral explanation across multiple levels of analysis—from molecular neurochemistry to cognitive psychology to evolutionary theory—without establishing clear bridges between these domains. This disciplinary fragmentation has limited the development of unified theoretical frameworks that can account for both the biological mechanisms and environmental contingencies governing motivated behavior.

The Proximal Chemical Mandate Principle addresses this gap by proposing a foundational reduction of behavioral motivation to two invariant neurochemical processes: reward signal maximization (R↑) and stress signal minimization (S↓). This framework does not claim to capture the full complexity of human experience, but rather provides a systematic starting point for understanding how neurochemical computations generate behavior across diverse environmental contexts.

We develop a three-tiered hierarchy (Proximal Purpose → Specific Utility Purpose → Ultimate Outcome) that links instantaneous neurochemical processes to long-term adaptive consequences through identifiable biological mechanisms. The framework specifically accounts for why identical optimization principles produce adaptive outcomes in ancestral environments (Natural Selection Field), mixed outcomes in meaning-seeking contexts (Natural Epistemophilia Field), and maladaptive patterns in modern environments (Natural Counterproductive Field).

By reducing behavioral explanation to fundamental neurochemical mandates while maintaining environmental contingency, this approach offers a parsimonious foundation upon which more complex models of human motivation can be built. The framework integrates existing neuroscientific evidence while generating testable predictions through formal thought experiments, providing a systematic approach to understanding the biological basis of behavior across its adaptive and maladaptive expressions.

2. Core Theoretical Principles

2.1. Principle 0 : Boundary Condition

The Proximal Chemical Mandate Principle applies specifically to organisms possessing neurochemical systems capable of generating and responding to distinct reward (R↑) and stress (S↓) neurochemical signals.

2.2. Principle 1 : Invariance and Instantaneity of Dynamic Optimization

The objectives to maximize **R↑ or** (inclusive 'or') minimize **S↓** represent fundamental computational goals emerging from conserved neurobiological architectures. These objectives function as biological constants operating through instantaneous neurochemical computations that respond to current **net proximal value**.

2.3. Principle 2 : Mutability of Implementation Mechanisms

While dynamic optimization objectives remain stable and instantaneous, their implementation shows considerable **plasticity**. Behavioral adaptation occurs through modification of reward or pleasure **object selection, associative memory formation, and strategic responses**, enabling local dynamic optimization while maintaining invariant goals.

2.4. Principle 3 : Environmental Determination of Fitness Outcomes

The relationship between chemical dynamic optimization and Ultimate outcome **(Uo)** is environmentally contingent. The invariant mandate produces **adaptive** outcomes in **Natural Selection Field** and potentially **maladaptive** outcomes in **Natural Counterproductive Field**.

2.4.1. Three Environmental Domains of Human Behavior

Human behavior manifests across three distinct environmental contexts, each producing characteristic outcomes through the operation of the invariant (R↑,S↓) optimization processes:

Natural Selection Field

- Environments where neurochemical optimization aligns with evolutionary success
- Behaviors directly support survival and reproductive fitness
- Represents the ancestral context that shaped our neurochemical systems
- Provides the evolutionary baseline for understanding modern behavioral patterns

Natural $^{\mathcal{C}\text{ulture}}$Epistemophilia$_{\mathcal{A}\text{rt}}$ Field

- Environments characterized by meaning-seeking and knowledge acquisition
- Behaviors driven by the pursuit of understanding and purpose
- Produces mixed outcomes:
  - **A** Zone: Relationships, love, religious meaning, Festivals, art, voluntary childlessness, hard work, scientific research, Discovery, Ethics - typically supporting survival and mostly reproduction(Not always)
  - $_{mal}$**A** Zone: Extreme adventure, dangerous exploration, war, conflict, tasty food over healthy food - often reducing survival fitness

Natural Counterproductive Field

 doi:10.20944/preprints202511.1254.v1

- Environments where neurochemical optimization produces outcomes that reduce wellbeing and survival
- Includes behaviors such as addiction, suicide, and other maladaptive patterns
- Represents contexts where immediate chemical optimization conflicts with long-term flourishing

These domains illustrate how the same underlying chemical optimization principles produce different behavioral outcomes depending on environmental context, highlighting the importance of environmental structure in determining whether neurochemical drives lead to adaptive or maladaptive results.

3. The Natural Selection Field (NSF)

3.1. Definition and Alignment

The Natural Selection Field (NSF) represents the environmental conditions where proximal chemical dynamic optimization produces **'Uo'**: maximal evolutionary fitness (F), such as the ancestral environment that shaped neurochemical architecture. In this domain, strategies promoting survival and reproduction align with maximal chemical reward and minimal stress.

3.2. Operation of Invariant Mandates

3.2.1. Instantaneous Reward Signal Maximization (R↑)

Within the Natural Selection Field (NSF), maximum R↑ is achieved through behaviors enhancing reproduction and survival. Neurochemical reward systems reinforce activities such as successful reproduction, kin investment, and consumption of necessary resources through instantaneous computations that sustain rewarding actions.

3.2.2. Instantaneous Stress Signal Minimization (S↓)

The S↓ mandate operates through stress responses proportional to genuine, acute threats to survival. Successful minimization of such stress correlates with enhanced survival and longevity within the Natural Selection Field (NSF) through immediate withdrawal or avoidance responses.

4. The Natural $^{\mathcal{C}\text{ulture}}$Epistemophilia$_{\mathcal{A}\text{rt}}$ Field

Human environments are characterized by a fundamental drive toward meaning-making and understanding - what might be termed the Natural Epistemophilia Field. This domain encompasses the human tendency to seek purpose, comprehend the universe, and understand one's place within it. Within the framework of the Proximal Chemical Mandate Principle, these meaning-seeking behaviors represent sophisticated implementations of the fundamental (R↑,S↓) optimization processes.

The pursuit of meaning and knowledge generates substantial neurochemical rewards through several pathways. Understanding complex concepts, discovering patterns, and achieving moments of insight provide potent R↑ signals through dopamine-mediated reward systems. Similarly, finding coherent explanations for existential questions and establishing purposeful frameworks for living effectively reduces the S↓ signals associated with uncertainty, ambiguity, and existential anxiety.

This meaning-seeking drive manifests in both adaptive and maladaptive forms, all emerging from the same underlying chemical optimization processes:

A Zone:

- Formation of meaningful relationships and social bonds that provide oxytocin-mediated rewards and reduce loneliness-related stress
- Religious and spiritual practices that offer coherent worldviews, reducing existential anxiety while providing community-based rewards
- Musical engagement and appreciation that generates dopamine release, emotional regulation, and social connection through shared aesthetic experience
- Artistic and creative expression that generates flow states and aesthetic pleasure

- Athletic achievement and sports participation that combine endorphin release with social reinforcement
- Humanitarian activities that provide purpose-derived rewards while reducing distress through altruistic engagement

$_{mal}$**A** Zone:

- Excessive risk-taking and dangerous exploration driven by novelty-seeking beyond reasonable safety parameters
- Obsessive pursuit of mysteries or truths at the expense of personal wellbeing and relationships
- Ideological extremism and conflict arising from rigid meaning systems that override broader ethical considerations
- Self-sacrificial behaviors where the chemical rewards of heroism or martyrdom override survival instincts
- junk food, sugary food

The critical distinction between adaptive and maladaptive expressions lies not in the underlying chemical optimization process, which remains invariant, but in the environmental context and implementation strategies. Adaptive meaning-seeking enhances survival and flourishing within contemporary environments, while maladaptive forms provide immediate chemical optimization at the cost of long-term wellbeing.

This perspective suggests that the human drive for meaning represents neither a transcendent spiritual quality nor a purely rational pursuit, but rather an emergent property of neurochemical systems optimized for ancestral environments now operating in complex modern contexts. Understanding this foundation allows for more intentional cultivation of meaning structures that provide sustainable chemical rewards while supporting overall wellbeing.

5. An Integrated Hierarchy

The Proximal Chemical Mandate Principle (**R**↑**, S**↓) establishes a deterministic, three-tiered hierarchy of motivation and outcome that governs behavior in organisms with neurochemical systems. This hierarchy links the instantaneous drivers of action to long-term, contingent consequences through a structured framework of neurochemical computation and environmental interaction.

5.1. Three-Tiered Structure

- **Level 1: Proximal Purpose (Px)** - The fundamental neurochemical driver
- **Level 2: Specific Upayogitā Purpose (Xm)** - Evolved functional objectives
- **Level 3: Ultimate Outcome (Uo)** - Long-term environmental consequences

5.2. Causal Relationship

The hierarchical framework operates through a deterministic causal chain:

$$\text{Proximal Purpose } (\mathbf{Px}) \rightarrow \text{Fulfillment of } \mathbf{Xm} \text{ (via } \mathbf{OsC}) \rightarrow \text{Ultimate Outcome } (\mathbf{Uo})$$

5.3. Identifier Sensor (**I-s**) - The Environmental Interface

The conceptual variable **I-s** (Identifier Sensor) represents the proximate biological apparatus used to detect and process environmental cues that match the genetically-influenced **OsC**(Object Selection Criteria) for a specific **Xm**.

Definition: The specific sensory apparatus (e.g., eyes, nose, skin receptors, etc) that detects environmental cues matching the **OsC**

Role: Acts as the input interface. When the **I-s** detects an **OsC** cue, the associated neurochemical valuation system is triggered, resulting in a **Px** signal (**R**↑ or **S**↓)

5.3.1. **I-s** Implementation in the Natural Selection Field

The **I-s** connects environmental stimuli to **OsC** criteria, triggering subsequent **Px** mandate fulfillment:

- **Energy Consumption**
  - *OsC:* High sugar/fat content
  - *I-s:* Taste receptors (tongue), olfactory receptors (nose)
  - *Px Signal:* **R**↑ (pleasure/palatability)
- **Safety/Acute Threat**
  - *OsC:* Sudden, loud, or rapidly approaching stimuli
  - *I-s:* Auditory receptors (ears), visual receptors (eyes)
  - *Px Signal:* **S**↑ (fear/arousal) leading to **S**↓ (avoidance)
- **Mate Selection**
  - *OsC:* Visual cues of beauty/strength (e.g., symmetry)
  - *I-s:* Visual receptors (eyes)
  - *Px Signal:* **R**↑ (seeking drive/attraction)
- **Body Temperature Regulation**
  - *OsC:* Extreme thermal deviation (hot/cold)
  - *I-s:* Thermoreceptors (skin)
  - *Px Signal:* **S**↑ (discomfort) leading to **S**↓ (seeking comfort)

The **I-s** constitutes the first step in the entire deterministic process, translating environmental information into the chemical signals that drive behavior.

*5.4. Level 1: Proximal Purpose (**Px**) - The Invariant Driver*

The **Px** represents the core invariant mandates that drive all motivated behavior through instantaneous neurochemical computations.

Definition: The Invariant Mandates: **R**↑ (Reward Signal Maximization) and **S**↓ (Stress Signal Minimization)

Role: Serves as the immediate cause of every action, compelling withdrawal, initiation, or maintenance of motor patterns based on instant neurochemical computation of current net proximal value

*5.5. Level 2: Specific Upayogitā Purpose (**Xm**) - The Evolved Objective*

$$\text{Sanskrit} : \textit{Upayogitā} \rightarrow \text{English} : \textit{Utility}$$

The **Xm** represents intermediate functional objectives that the **Px** mandates are evolutionarily designed to achieve.

Definition: Intermediate Functional Objectives (e.g., Energy Consumption, Body Temperature Maintenance, Healthy Reproduction)

Role: Fulfillment occurs when **Px** mandates successfully execute for specific biological needs; dictates the Object Selection Criteria (**OsC**)

5.5.1. Object Selection Criteria (**OsC**) Implementation

The **OsC** system assigns initial neurochemical valence to stimuli based on their relevance to specific **Xm** objectives:

- **Energy Consumption**
  - *Mandate:* **R**↑ and **S**↓ (hunger)
  - *OsC:* High sugar, fat, and salt content

- **Body Temperature Regulation**
  - *Mandate:* **S**↓ (thermal discomfort)
  - *OsC:* Ambient temperature change toward comfort zone
- **Healthy Reproduction**
  - *Mandate:* **R**↑ (offspring contact)
  - *OsC:* Sex-specific physical cues(e.g., beauty for males, muscular body for females) and bonding signals

*5.6. Level 3: Ultimate Outcome (**Uo**) - The Contingent Consequence*

The **Uo** represents the final, long-term consequences emerging from cumulative **Xm** implementations.

Definition: Final Long-Term Consequences resulting from accumulation of successful **Xm** solutions

Environmental Contingency:
- *Natural Selection Field:* **Uo** equal to Evolutionary Fitness (Survival and Reproduction)
- *Natural Counterproductive Field:* **Uo** equal to maladaptation and reduced wellbeing

5.7. Adaptive Examples in the Natural Selection Field (NSF)

The following examples illustrate how the integrated hierarchy operates within the Natural Selection Field, demonstrating the complete causal chain from sensory detection to ultimate fitness outcomes:

- **Xm: Acquiring Shelter**
  - *I-s:* Thermoreceptors (skin) detect cold
  - *OsC:* Thermal discomfort (deviation from comfort zone)
  - *Px:* **S**↓ - Minimize stress caused by thermal discomfort
  - *Uo:* Maximized survival (avoids hypothermia)
- **Xm: Consuming Ripe Fruit**
  - *I-s:* Taste receptors detect sweetness
  - *OsC:* High sugar content (signaling high caloric value)
  - *Px:* **R**↑ - Maximize reward and pleasure of palatability
  - *Uo:* Maximized survival (ensures energy intake)
- **Xm: Avoiding Predator**
  - *I-s:* Eyes/ears detect sudden visual or auditory threat signals
  - *OsC:* Rapid movement/loud sound (signals danger)
  - *Px:* **S**↓ - Minimize instantaneous stress via fight-or-flight
  - *Uo:* Maximized survival (avoids immediate death)
- **Xm: Parental Care**
  - *I-s:* Auditory receptors detect infant crying
  - *OsC:* Offspring distress signal (crying)
  - *Px:* **R**↑ - Maximize reward from oxytocin/dopamine release during caregiving
  - *Uo:* Maximized reproduction (perpetuates genes)
- **Xm: Seeking Water**
  - *I-s:* Internal chemoreceptors detect low blood volume/high osmolarity (thirst)
  - *OsC:* Aversive internal **S**↑ signal (thirst)
  - *Px:* **S**↓ - Minimize stress caused by internal aversive signal
  - *Uo:* Maximized survival (maintains hydration)
- **Xm: Social Cooperation**
  - *I-s:* Visual/auditory receptors detect positive gestures or successful joint activity

  - *OsC:* Mutual benefit/reciprocal aid (reduces individual **S**↑ effort)
  - *Px:* **S**↓ - Minimize stress/risk of solitary resource acquisition
  - *Uo:* Maximized survival (secures shared resources)
- **Xm: Mate Selection (Male)**
  - *I-s:* Eyes detect facial symmetry and feminine features
  - *OsC:* Visual cues of fertility (signaling reproductive value)
  - *Px:* **R**↑ - Maximize reward associated with successful mate acquisition
  - *Uo:* Maximized reproduction (optimizes genetic yield)

These examples demonstrate the complete causal pathway operating within the Natural Selection Field, where the invariant **Px** mandates reliably produce adaptive **Uo** outcomes through evolutionarily calibrated **OsC** criteria and **I-s** detection systems. Each scenario shows how proximate chemical optimization aligns with ultimate fitness maximization in ancestral environmental conditions.

5.8. Integrated Causal Flow

The framework's deterministic operation follows a clear hierarchical progression:

1. **Sensory Detection: I-s** identifies environmental cues matching **OsC** criteria
2. **Proximal Initiation: Px** drives instantaneous action through neurochemical computations triggered by sensory input
3. **Functional Execution:** Action follows **OsC** pathways determined by **Xm** objectives through evolutionarily programmed valuation systems
4. **Environmental Outcome:** Cumulative **Xm** implementations produce **Uo** consequences based on environmental context alignment

Key Variables:

- **I-s** - Identifier Sensor (sensory input interface)
- **Px** - Proximal Purpose (invariant neurochemical mandates)
- **Xm** - Specific Upayogitā Purpose (evolved functional objectives)
- **OsC** - Object Selection Criteria (neurochemical valuation system)
- **Uo** - Ultimate Outcome (environmentally contingent consequences)

This integrated hierarchy demonstrates how invariant neurochemical mandates produce diverse behavioral outcomes through structured computational processes operating across multiple temporal and functional scales, with environmental context determining the ultimate adaptive value of these processes.

6. Methodological Foundation: Formal Thought Experiments and Suggestions

Note:*"The following section presents only conceptual thought experiments designed to clarify the theoretical framework. These experiments are intended for conceptual exploration rather than empirical implementation, as they involve interventions that raise ethical concerns; they are designed purely for conceptual exploration, respecting all ethical boundaries."*

6.1. Thought Experiment 1: "No Effect, No Will" (The Necessary Condition)

This conceptual experiment examines whether neurochemical signaling constitutes a necessary prerequisite for motivated behavior, affect, and volition.

6.1.1. Rationale and Limitations of Existing Evidence

The theoretical framework posits that chemical effects are required to initiate action. Dopamine depletion studies demonstrate reduced motivation to work for rewards, yet animals retain capacity for consummatory pleasure when rewards are directly administered. This partial dissociation suggests that while dopamine systems mediate motivational aspects, other neurochemical pathways contribute to affective experience.

Preprints.org (www.preprints.org) | NOT PEER-REVIEWED | Posted: 17 November 2025 doi:10.20944/preprints202511.1254.v1

6.1.2. Conceptual Design

The experiment considers temporary, simultaneous pharmacological inhibition of multiple neurochemical systems involved in dynamic optimization signaling:

- Reward pathways: Dopamine (motivational drive, seeking), opioid (pleasure, liking), and cannabinoid (valuation) systems
- Stress pathways: HPA axis and sympathetic nervous system activation

Sensory and motor functions remain intact under this theoretical intervention.

6.1.3. Predicted Outcome and Interpretation

The theoretical prediction is **behavioural inertia** across motivational domains. Without neurochemical effect for valuation and affect, the organism would not initiate goal-directed behavior or exhibit preference-based responses.

6.2. Thought Experiment 2: "Liking The Unlike" (The Sufficient Condition)

This conceptual experiment examines whether neurochemical manipulation can sufficiently determine subjective valuation independent of evolutionary programming and self preference.

6.2.1. Rationale and Empirical Foundation

The theoretical framework suggests that R↑ signaling plays a primary role in value assignment(liking and seeking towards). **Conditioned place preference** paradigms demonstrate that neutral environmental cues can acquire motivational significance through association with neurochemical reward signals, providing preliminary support for this proposition.

6.2.2. Conceptual Design

The experiment extends existing conditioning paradigms by systematically pairing evolutionarily aversive(e.g., predator cues) and self preference of avoidance stimuli with artificially amplified R↑ signaling. This design conceptual tests the boundaries of neurochemical valuation and preference systems by examining whether reward signals can override deeply ingrained aversive response and self preference of avoidance.

6.2.3. Theoretical Elaboration: Neurochemical Determinism in Subjective Valuation

This formally elaborates on the "Liking The Unlike" paradigm, exploring its implications for neurochemical determinism in subjective preference formation.

6.2.4. Central Thesis and Operational Hypothesis

The thought experiment posits that subjective preference represents a chemically determined behavioral trigger rather than free cognitive choice. The operational hypothesis states that pairing an aversive stimulus with exogenous neurochemical manipulation inducing high reward (R↑) and low stress (S↓) signaling will convert avoidance behavior to approach behavior.

The formal transformation can be represented as:

$$\text{Initial Aversion to } \mathbf{A} \rightarrow \text{Dynamic Manipulation } (\mathbf{R}\uparrow, \mathbf{S}\downarrow) \rightarrow \text{Subsequent Preference for } \mathbf{A}$$

where **A** represents the aversive stimulus, and **R** and **S** represent temporal dynamics of reward and stress neurochemicals respectively.

6.2.5. Experimental Design: Five Sensory Applicability

The experimental validation employs five sensory modalities to demonstrate sensor-independent applicability:

- **Visual**: Pairing disliked visual stimuli with reward signaling
- **Auditory**: Converting aversive sounds to preferred stimuli

 doi:10.20944/preprints202511.1254.v1

- **Gustatory**: Re-valuing repulsive tastes through chemical reinforcement
- **Tactile**: Transforming uncomfortable textures to desirable ones
- **Olfactory**: Converting foul odors to preferred scents

6.2.6. Philosophical and Empirical Foundations

The paradigm challenges traditional concepts of hedonic agency, suggesting that "taste" or "preference" represents a chemically determined state rather than rational choice.

Empirical support comes from Conditioned Place Preference (CPP) studies, where neutral or aversive environments acquire positive valence through association with neurochemical reward signals. This demonstrates that aversion-to-preference conversion is biologically achievable through manipulation of reward-stress signaling dynamics.

6.3. Thought Experiment 3: "The Mandate Proof by Disprovement" (The Meta-Cognitive Loop)

This conceptual experiment examines whether the invariant mandate can assimilate even conscious attempts to disprove or circumvent it, thereby functioning as a self-consistent principle.

6.3.1. Rationale and Conceptual Design

The experiment investigates whether abstract intellectual goals are ultimately co-opted by the proximal chemical mandate. A conscious individual is motivated to consistently act opposite to the mandate's partial predictions—deliberately seeking suboptimal rewards and enduring avoidable stress—with the explicit goal of disproving the theoretical framework.

6.3.2. Predicted Outcome and Interpretation

The theoretical prediction is that even counter-mandate behavior represents execution of the invariant mandate through highest cortical regions:

- **Intellectual Reward Maximization**: The cognitive process of disproving a theory provides R↑ signals through novelty, intellectual mastery, and potential status enhancement.
- **Stress Minimization through Resolution**: The individual's intellectual distress (S↓) concerning the framework's simplicity is minimized through engagement in the disproof process, representing a learned implementation strategy.The high stress(the thought 'how i can't have free choice') reduction.
- **Meta-Cognitive Assimilation**: Conscious reflective effort itself functions within the mandate, with consciousness providing the phenomenological experience of autonomous will, while remaining governed by underlying chemical optimization principles.

This thought experiment demonstrates that if the Proximal Chemical Mandate Principle accurately describes the fundamental basis of human behavior, then the act of attempting(a human behaviour) to falsify the principle must itself constitute human behavior governed by these same chemical mandates. This represents scientific consistency rather than unfalsifiability: the principle remains empirically testable through experimental methods, while simultaneously accounting for the motivational drivers behind all human behaviors, including scientific skepticism and theoretical challenge. The framework's comprehensive nature requires that it applies equally to behaviors aimed at its verification and those aimed at its refutation.

"By knowing the law,we can't violate the law, because knowing itself is the law!"

6.4. Thought Suggestion: "The Brain Knows To Own"

This thought suggestion proposes that optimal behavioral outcomes emerge when neurochemical systems possess accurate information about the consequences of different actions. Under specific conditions, the brain can self-organize toward flourishing through its inherent optimization processes.

6.4.1. Prerequisites for Effective Implementation

The framework operates under two critical conditions:

- **Positive Condition**: Individuals must have no prior engagement with addictive or harmful behaviors, maintaining a baseline neurochemical state unaffected by maladaptive reinforcement patterns.
- **Engagement Requirement**: Information must be presented in compelling, engaging formats that resonate emotionally and cognitively, moving beyond conventional educational approaches to create proper neurochemical reinforcement.

6.4.2. Reinforcement Mechanisms

Stress Minimization Pathway:

- Comprehensive understanding of the severe consequences of addictive behaviors
- Absence of experiential knowledge regarding the pleasurable aspects of such behaviors
- Clear association between harmful activities and significant stress signals

Reward Maximization Pathway:

- Recognition of activities that provide sustainable pleasure while supporting long-term wellbeing
- Environmental structures that naturally reinforce flourishing-oriented behaviors
- Avoidance of using stressful methods(eg.advice, forcing, etc) as the primary motivational tool in educational contexts

6.4.3. Theoretical Outcome

When these conditions are met, the brain's optimization processes naturally align with flourishing outcomes. The neurochemical system, operating with accurate information about what genuinely supports wellbeing versus what undermines it, executes the invariant mandates in ways that produce adaptive, sustainable behaviors.

This thought does not imply free will but rather demonstrates how the invariant mandates, when provided with accurate environmental information and operating in conducive conditions, can produce optimal outcomes without requiring any departure from the fundamental principles of neurochemical optimization. The brain continues to follow the (R↑,S↓) mandates, but does so in an environment where these mandates naturally produce flourishing rather than dysfunction.

Note : *"The reinforcement needs to be strong enough to overcome any type of maladaptive environment."*

7. Affirmation on Whole Reward Maximization

The initial formulation of the invariant objective as Reward Signal Maximization (R↑) is robustly defined as the maximization of the entire proximal reward experience, necessarily encompassing distinct neurochemical systems that operate in concert to achieve comprehensive optimization.

7.1. Neurochemical Specificity and Unity

The distinction between dopamine and opioid systems confirms that the brain employs multiple, specialized chemical pathways to achieve the single invariant goal of R↑:

- **Dopamine System (The Seeking Drive)**: As evidenced by dopamine depletion studies, dopamine is crucial for motivational effort and the seeking component of reward. The absence of this signal substantially impairs goal-directed initiation while leaving consummatory capacity intact.
- **Opioid System (The Liking Drive)**: Current reward research indicates the opioid system mediates hedonic impact or "liking" components of reward. This system enables continued consumption behaviors (e.g., swallowing food placed in the mouth) even when motivational seeking systems are compromised.

7.2. Integrated Mandate Execution

The Proximal Chemical Mandate Principle correctly integrates these complementary systems:

- The Invariant Mandate (R↑) is satisfied not by maximizing any single neurotransmitter system (eg.only dopamine), but by optimizing the net positive proximal value delivered by all chemical contributors—both the motivation to obtain rewards and the pleasure derived from their consumption.
- The residual consumption behavior observed in dopamine depletion studies does not contradict the framework, but rather demonstrates partial execution of the invariant mandate: while seeking mechanisms are disabled, consumption mechanisms (opioid system) remain available to execute the 'maximize pleasure' component of R↑ when stimuli are delivered passively.

This integrated perspective demonstrates that the invariant mandate operates through coordinated neurochemical systems rather than through any single pathway, with different systems contributing complementary components to overall reward optimization while maintaining the fundamental R↑ objective.

8. The Instantaneous Nature of Neurochemical Dynamic Optimization

8.1. The Self-Optimizing Mandate System

The invariant mandate operates as a self-optimizing system that continuously improves its own execution. When the system processes that cognitive reflection and prediction can enhance (R↑,S↓) outcomes, the mandate inherently drives these processes because improved prediction capability represents superior mandate fulfillment. This creates a self-reinforcing loop where the mandate optimizes its own implementation mechanisms.

8.2. Two Type of Mandates

The system operates through immediate neurochemical computations based on current **net proximal value**, ensuring continuous optimization across all cognitive states. The entire cognitive sequence—initiation, maintenance, and cessation of thinking—represents different phases of mandate execution driven by dynamic (R↑,S↓) optimization.

8.3. Simple Mandate: Subcortical Instantaneous Reactions

- **Continuing Initial Action (R↑)**: Positive signals trigger immediate continuation of current motor patterns.
- **Avoiding Initial Action (S↓)**: Aversive signals trigger instant withdrawal responses.

8.4. Complex Mandate : Predictive Optimization Through Cortical Processing

The mandate employs **The Prefrontal Cortex (PFC)** systems specifically because enhanced prediction improves chemical outcomes:

- **Mandate-Driven Metacognition**: The system engages in thinking because it computes that predictive modeling yields superior (R↑,S↓) outcomes compared to immediate action.
- **Self-Improving Computation**: Each cognitive cycle refines the mandate's predictive accuracy, creating progressively better optimization through:
  - Learning from prediction-outcome mismatches
  - Building more accurate environmental models
  - Developing more effective implementation strategies
- **Adaptive Process Management**: The mandate continuously evaluates whether thinking, acting, or resting provides optimal chemical payoff, dynamically shifting between states based on real-time computation.
- **Capacity Dependency**: These predictive optimization processes occur only when the brain possesses sufficient cognitive capacity and access to past experiential data for effective forecasting.

8.5. Interpretation-Reality Discrepancy and Behavioral Outcomes

The dynamic nature of instantaneous mandate execution can produce behaviors that appear sub-optimal due to discrepancies between the brain's interpretation and actual environmental conditions. The system operates on current chemical states and PFC predictions, which may not accurately reflect external reality, leading to phenomena such as procrastination when computational resolution remains incomplete. Even passive states like sitting calmly represent active mandate execution, where the system calculates that reduced environmental engagement optimizes decision-making capacity based on past experience, current PFC resources, and present chemical conditions.

8.6. The Recursive Nature of Cognitive Optimization

The system exhibits fundamental recursion: the mandate optimizes its own optimization processes through:

- **Secondary Optimization**: Using cognitive processes to improve how the mandate itself is executed
- **Tertiary Forecasting**: Predicting how different thinking strategies will affect future mandate fulfillment
- **Emergent Efficiency**: Developing increasingly sophisticated implementation mechanisms through iterative refinement

8.7. Phenomenological Reflections of Predictive Computation

Conscious experience tracks the mandate's predictive optimization processes:

- **Procrastination**: Indicates nearly equal chemical payoffs between competing predictive pathways
- **Insight Experiences**: Represent sudden computational resolutions where predictive models achieve clarity
- **Uncertainty**: Reflects the system's awareness of improper predictive data
- **Confidence**: Signals strong alignment between predictions and expected chemical outcomes

This reveals that human cognition emerges from the mandate's inherent drive to improve its own execution through predictive modeling. The system engages in thinking not despite its chemical determinism, but because enhanced prediction represents the most effective strategy for fulfilling the fundamental (R↑,S↓) optimization objectives.

Note: *"While complete stress minimization or pleasure maximization may unfold over time and can vary, every individual action—whether initiating behavior, withdrawing from stimuli, or engaging in dynamic activities—represents immediate mandate fulfillment. The system operates through continuous instantaneous computations, where each moment of behavior constitutes execution of the (R↑,S↓) optimization process, regardless of whether the ultimate chemical objective has been fully achieved. The mandate is fulfilled through the ongoing process of optimization itself, not merely through final outcomes."*

9. Resolution of Apparent Evolutionary Paradoxes

9.1. Addiction

Supernormal stimuli, such as psychoactive substances, can generate reward signals exceeding natural rewards, potentially hijacks and achieves the instantaneous R↑ dynamic optimization process with fitness costs.

9.2. Altruism

Behaviors providing chemical rewards through stress(sudden stress spike, when seeing an individual suffering from a threat) reduction and social bonding may be prioritised over ultimate genetic consequences when environmental conditions decouple proximate reward from ultimate fitness.

 doi:10.20944/preprints202511.1254.v1

9.3. Voluntary Childlessness

Modern environments may impose **chronic** stress on parenting, potentially driving individuals toward alternative reward pathways offering more favorable chemical dynamics through instantaneous dynamic optimization calculations.

9.4. Suicide

Under conditions of irreversible, catastrophic stress, self-termination might represent an extreme fulfillment of the S↓ mandate, though this interpretation requires **careful ethical and scientific consideration**.

By understanding this, we can give proper medical support for a better life.

9.5. Hard Work and Delayed Gratification

Hard work and persistence represent sophisticated implementation of the instantaneous R↑ maximization framework, mediated by prefrontal cortical systems involved in temporal valuation. The prefrontal cortex (PFC) supports executive functions that model future outcomes, enabling the calculation of long-term R↑ benefits against immediate costs. This computational process weighs delayed rewards (e.g., achievement, security) against the immediate S↓ costs of effort expenditure.

The sustained engagement in effortful tasks depends on intermittent R↑ signals that reinforce progress toward long-term objectives. These signals may include subjective markers of advancement, milestone achievement, or social recognition that maintain motivation across temporal delays. This mechanism demonstrates how complex cognitive systems implement the invariant mandates through sophisticated temporal computations that remain instantaneous in their decision execution.

9.6. Stress Minimization in Constrained Scenarios

Behavior under sustained duress, such as forced labor, can be understood as an implementation of the instantaneous S↓ mandate through predictive stress minimization. The prefrontal cortex evaluates available options by comparing current stress against anticipated future stress states through immediate computations.

In such scenarios, continued compliance represents a calculated strategy where:

- Current stress ($S\downarrow_{\text{Current}}$) is perceived as manageable and predictable
- Alternative actions risk catastrophic future stress ($S\downarrow_{\text{Future}}$) through punishment or threat escalation

The neurochemical system thus selects the implementation strategy that minimizes overall predicted stress exposure through instantaneous valuation. This framework demonstrates how the invariant S↓ mandate can produce seemingly paradoxical behaviors through sophisticated threat prediction that remains immediate in its operational execution.

10. Empirical Evidence

10.1. Evidence for Reward Maximization Mandate

10.1.1. Intracranial Self-Stimulation Studies

The seminal work of **Olds and Milner (1954)** demonstrated that rats would repeatedly press levers to receive electrical stimulation to specific brain regions, particularly the septal area and lateral hypothalamus. Animals would forgo food, water, and other natural rewards to maintain self-stimulation, often to the point of **exhaustion**. This provides compelling evidence for the R↑ mandate, showing that direct activation of reward pathways can override other biological drives through immediate dynamic optimization.

10.1.2. Dopamine and Reward Prediction

Research by **Schultz (2015)** and colleagues has consistently shown that dopamine neurons code reward prediction error, firing most vigorously when rewards are unexpected or higher then expected.

This phasic dopamine signaling reinforces behaviors that lead to reward acquisition, providing a mechanistic basis for the R↑ mandate through reinforcement learning principles that operate on rapid timescales.

10.2. Evidence for Stress Minimization Mandate

10.2.1. Fight-or-Flight Response

The classic acute stress response, mediated by sympathetic nervous system activation and HPA axis involvement, demonstrates organized behavioral strategies aimed at immediate threat resolution. **Cannon's (1932)** early work and subsequent research show that organisms engage in fight, flight, or freeze behaviors specifically to eliminate or escape stressors, thereby fulfilling the S↓ mandate through active threat minimization that operates instantaneously.

10.2.2. Conditioned Avoidance Paradigms

Studies demonstrating that animals will learn complex behavioral sequences to avoid aversive stimuli provide additional evidence for the S↓ mandate. The persistence of avoidance behavior, even in the absence of ongoing threat, underscores the **strength of the stress minimization** imperative in guiding behavior through immediate computational processes.

10.3. Evidence for Instantaneous Neurochemical Processing

Research using real-time brain monitoring shows that reward and stress systems operate on very fast timescales, supporting the idea of immediate chemical optimization.

10.3.1. Fast Dopamine Signals for Reward

Studies reveal dopamine works in milliseconds to guide behavior:

- Dopamine signals update within 100-200 milliseconds when rewards change
- Real-time measurements show dopamine fluctuations match immediate behavior changes
- Dopamine levels shift instantly during approach/avoidance decisions

10.3.2. Rapid Stress Response Systems

Stress detection and response happens equally quickly:

- Threat detection in the amygdala occurs within 150 milliseconds
- Stress triggers immediate dopamine release in emotional centers
- Fear memories form through instant chemical changes

10.3.3. Quick Decision Processing in Brain's Control Center

The prefrontal cortex makes rapid calculations:

- Stress immediately affects how the brain processes rewards
- Stress causes instant changes in decision strategies
- Brain imaging shows real-time coordination between control and emotion areas

Together, this evidence shows that the brain's chemical optimization happens through rapid, continuous computations rather than slow, deliberate thinking, supporting the framework's emphasis on instantaneous processing.

10.4. Evidence from Temporal Dynamics of Decision Processes

10.4.1. Timing of Mandate Execution (Readiness Potential Studies)

Research on the electrical activity preceding voluntary actions demonstrates the temporal sequence of neurochemical mandate execution:

- **Early Neural Initiation**: The brain generates a Readiness Potential (RP) approximately 635 milliseconds before physical movement, representing completion of the underlying chemical optimization process

- **Action Execution Timing**: Motor initiation occurs approximately 200 milliseconds after the decision signal, creating a 435-millisecond period where the mandate has been executed before physical action begins
- **Empirical Implication**: This temporal sequence indicates that the invariant mandate operates through rapid neural computations that precede behavioral output, consistent with the framework's emphasis on instantaneous neurochemical optimization

10.4.2. Rapid Cognitive Resolution in Complex Decisions

Even sophisticated decisions involving delayed gratification demonstrate rapid neural resolution:

- **Prefrontal Cortex Involvement**: Choices favoring delayed rewards show increased anterior PFC activation, indicating complex temporal valuation
- **Resolution Speed**: The P300 component, marking decision completion, registers between 200-600 milliseconds post-stimulus, demonstrating rapid computation relative to subjective deliberation
- **Unified Processing**: Evidence supports a single valuation system performing continuous optimization, rather than separate impulsive and rational systems competing for control

These findings support the framework's claim that behavioral decisions emerge from rapid neurochemical optimization processes, with the mandate execution preceding observable action through instantaneous computational resolution.

11. Philosophical Interpretation: Consciousness and Agency

The invariant nature of the chemical mandates necessitates a deterministic interpretation of consciousness, redefining it as a state reflection of the system's ongoing dynamic optimization, which creates the phenomenological experience of autonomous agency (rational choice).

11.1. Consciousness as State Reflection and Adaptive Truth Avoidance

"Consciousness is a quality of possessing the current brain's state!"

This state reflection is evident even in involuntary actions. In simple reflexes (e.g., the withdrawal reflex), the S↓ dynamic optimization is executed by the spinal cord without requiring the cerebral cortex's input. Despite not initiating the action, the sensory information of the reflex and its consequences are subsequently transmitted to the brain. Consciousness then possesses or becomes aware of this output, confirming that consciousness functions as the system's subjective monitor and narrator, not its ultimate initiator.

Crucially, natural selection has shaped cognitive systems to avoid representing the actual truth that organisms are deterministic reflectors of chemical mandates in the purest form. This adaptive mechanism could provides the system with the most realistic, compelling illusion of being the initiator of action, which is perhaps necessary for complex goal formation and persistent social coherence. The phenomenological experience of agency emerges as an evolutionarily adaptive interface that facilitates effective behavioral coordination while masking the underlying deterministic processes.

11.2. The Illusion of Decision

The subjective experience of decision-making is the phenomenological construct generated by the brain's integration and rapid resolution of competitive neurochemical signals. A choice is merely a competition between multiple potential implementation mechanisms, each assigned a (R↑,S↓) dynamic optimization value by the deterministic chemical architecture. Consciousness observes this singular, resolved pathway and misattributes the deterministic chemical output as an independent, self-initiated act of **"will"**.

This illusion of decision represents the ultimate expression of evolutionary design that masks deterministic reality. The temporal sequence where conscious awareness follows neurochemical resolution creates the compelling but false impression of causal agency. The brain's narrative construction system generates coherent explanations for behaviors that were actually determined by prior neurochemical computations, providing the necessary phenomenological framework for effective social interaction and long-term planning while operating within invariant chemical constraints.

11.3. The Paradox of Causal Experience

"We are not the cause, we are an effect, but the effect itself creates 'The Thought of Cause'!"

This statement captures the fundamental paradox of conscious experience. While we phenomenologically experience ourselves as causal agents initiating actions, we are actually the products of deterministic neurochemical processes. The feeling of being a cause emerges as an effect of the brain's computational processes, creating the compelling but illusory experience of volition.

The thought "I caused this" is itself generated by the same neurochemical optimization that produces the behavior it claims to have initiated. This creates a self-referential loop where the system's output (conscious experience of agency) identifies itself as the system's input (causal decision-maker). The experience of free will represents the brain's post-hoc narrative construction that misattributes the source of behavioral initiation from underlying chemical computations to the conscious self.

"Even if we agree that consciousness is an illusion, we can never get rid of it."

12. Fundamental Reductions of Biological and Behavioral Driver

The Proximal Chemical Mandate Principle asserts that all biological actions, including those critical for survival, are not initiated by abstract, rational purposes but are executed as implementation strategies driven by the invariant chemical objectives of Reward Signal Maximization (R↑) and Stress Signal Minimization (S↓). Survival represents the optimal, contingent outcome when these mandates are perfectly fulfilled in the **Natural Selection Field (NSF)**, rather than serving as a primary motivational driver.

12.1. Reduction of Core Survival Behaviors:It is not an Abstract Purpose, It is the Chemical Mandate

1. **Hydration**
   - *Abstract Goal (Rejected)*: I must drink water to maintain blood volume and live.
   - *Chemical Mandate (Accepted)*: Minimize Stress (S↓) by drinking water. Thirst represents a direct, aversive internal S↑ signal, and drinking constitutes the instantaneous chemical solution.
2. **Energy Consumption**
   - *Abstract Goal (Rejected)*: I must eat to maintain metabolic function.
   - *Chemical Mandate (Accepted)*: Minimize Stress (S↓) of hunger and Maximize Reward (R↑) of palatability through consumption.
3. **Acute Threat Response**
   - *Abstract Goal (Rejected)*: I must fight or flee to avoid death.
   - *Chemical Mandate (Accepted)*: Minimize Instantaneous Stress (S↓) via fight-or-flight response. The mandate compels rapid action to eliminate acute S↑ signaling.
4. **Wound Healing**
   - *Abstract Goal (Rejected)*: My body must repair tissue damage to function.
   - *Chemical Mandate (Accepted)*: Minimize Stress (S↓) via pain reduction and Maximize R↑ through opioid-mediated comfort during healing processes.
5. **Thermoregulation**
   - *Abstract Goal (Rejected)*: I must maintain stable core temperature.
   - *Chemical Mandate (Accepted)*: Minimize Stress (S↓) caused by thermal discomfort. Seeking shelter represents an implementation strategy to restore a comfortable, low-stress S↓ baseline.

Preprints.org (www.preprints.org) | NOT PEER-REVIEWED | Posted: 17 November 2025 doi:10.20944/preprints202511.1254.v1

6. **Sleep**
   - *Abstract Goal (Rejected)*: My brain needs downtime for repair and memory consolidation.
   - *Chemical Mandate (Accepted)*: Minimize Chronic Stress (S↓) of fatigue and Maximize R↑ through intrinsic reward signals associated with rest and homeostatic restoration.
7. **Respiration**
   - *Abstract Goal (Rejected)*: I must breathe to oxygenate blood.
   - *Chemical Mandate (Accepted)*: Minimize Acute Stress (S↓) caused by carbon dioxide buildup. Suffocation sensations represent extreme S↑ signaling that dictates respiratory reflexes.
8. **Fear Conditioning**
   - *Abstract Goal (Rejected)*: I must remember dangers to ensure future safety.
   - *Chemical Mandate (Accepted)*: Minimize Predicted Stress (S↓) by forming strong associative memories. Avoidance learning represents a strategy yielding the highest probability of minimizing future S↑ exposure.
9. **Resource Acquisition**
   - *Abstract Goal (Rejected)*: I must secure food for myself and my family.
   - *Chemical Mandate (Accepted)*: Minimize Stress (S↓) through cooperative strategies. Individual resource acquisition produces excessively high physical S↑ (effort, hunger, injury risk), while cooperation yields superior S↓ optimization.
10. **Parental Investment**
   - *Abstract Goal (Rejected)*: I must care for offspring to perpetuate genes.
   - *Chemical Mandate (Accepted)*: Maximize Reward (R↑) from offspring contact and caregiving. Parental behaviors are reinforced by dopamine and oxytocin release, ensuring persistence of chemically rewarding actions.

12.2. Theoretical Implications

These reductions demonstrate that what appear as purposeful survival behaviors actually represent sophisticated implementation mechanisms for fulfilling invariant chemical mandates. The evolutionary success of these behaviors in ancestral environments stems from their reliable production of (R↑,S↓) optimization within the Natural Selection Field (NSF), rather than from any abstract recognition of their survival value. This perspective resolves the apparent teleology in biological systems by reducing complex behaviors to deterministic chemical computations operating through instantaneous valuation processes.

13. Novel Experimental Proposals

13.1. Experiment 1: "No Will to Self Stimulate" (Necessary Condition Test)

This experiment aims to test the necessary conditions for reward-seeking behavior by examining the effects of comprehensive neurochemical inhibition on established self-stimulation behavior.

The experimental design employs a two-phase intracranial self-stimulation (ICSS) paradigm. During Phase 1 (Acquisition), subjects establish stable self-stimulation behavior by pressing a lever that delivers electrical stimulation to reward pathways. In Phase 2 (Inhibition), subjects receive pharmacological antagonists that inhibit multiple reward-related neurotransmitter systems (dopamine, opioid, and related pathways).

The theoretical framework predicts complete cessation of lever pressing following neurochemical inhibition, supporting the hypothesis that reward signaling is necessary for motivated behavior. Continued lever pressing during the inhibition phase would challenge the proposed necessary condition.

13.2. Experiment 2: "Chemical Calculus of Choice" (Invariant Trade-off Test)

This experiment investigates how organisms prioritize competing optimization objectives by measuring preference hierarchies across environments with varying reward-stress trade-offs.

The experimental design utilizes a five-chamber apparatus where each chamber is conditioned with specific neurochemical value profiles through pharmacological manipulation:

- Chamber A: High Reward, Low Stress (20 R↑, 1 S↓)
- Chamber B: Moderate Reward, Moderate Stress (5 R↑, 8 S↓)
- Chamber C: Moderate Reward, Low Stress (5 R↑, 2 S↓)
- Chamber D: Moderate Reward, High Stress (5 R↑, 7 S↓)
- Chamber E: Low Reward, High Stress (2 R↑, 15 S↓)

During the testing phase, subject choice hierarchies are recorded during sequential chamber access. The framework predicts a preference hierarchy following (A >C >B >D >E), supporting the hypothesis that behavior is guided by integrated (R↑,S↓) computations. Random choice patterns or consistent preference for high-stress options would challenge this interpretation.

Note : *Future empirical testing should follow strict ethical guidelines.*

14. Discussion

The Proximal Chemical Mandate Principle proposes that behavior in neurochemical organisms can be understood through a fundamental reduction to two invariant optimization processes: reward signal maximization (R↑) and stress signal minimization (S↓). This framework represents a contemporary neurobiological instantiation of psychological hedonism, translating the classical pleasure-pain principle into specific chemical computations operating through identifiable neural pathways. While psychological hedonism has long posited that behavior seeks pleasure and avoids pain, our formulation provides concrete biological mechanisms and environmental contingencies that specify when these processes lead to adaptive versus maladaptive outcomes.

The framework's primary contribution lies in unifying diverse behavioral phenomena—from basic survival reflexes to complex meaning-seeking behaviors—under a single explanatory principle. By demonstrating how identical neurochemical mandates produce adaptive outcomes in Natural Selection Fields, mixed outcomes in Epistemophilia Fields, and maladaptive patterns in Counterproductive Fields, we bridge what traditionally appear as distinct categories of behavior. This unification addresses a significant limitation in current behavioral science, where adaptive and maladaptive behaviors are often studied through separate theoretical lenses.

We acknowledge the substantial complexity of neural systems and the potential oversimplification inherent in reducing behavior to two chemical mandates. The brain undoubtedly employs intricate computational networks, contextual modulation, and hierarchical processing that our framework does not fully capture. However, if one seeks to identify the most fundamental drivers from which more complex behaviors emerge, R↑ and S↓ optimization represent plausible candidates. This reduction serves as a starting point rather than a complete account—a foundation upon which more nuanced models can be built by incorporating additional layers of complexity.

Several limitations warrant consideration. The framework's deterministic stance, while consistent with neurobiological evidence, requires reconciliation with the phenomenological experience of agency. The thought experiments, while conceptually useful, face ethical constraints that limit empirical implementation. Additionally, the model currently treats reward and stress systems as relatively monolithic, whereas actual neurochemistry involves multiple interacting subsystems with potentially competing signals.

Future research should focus on developing more precise mathematical formulations of the net proximal value computation, investigating how different neurochemical systems interact during mandate execution, and exploring the neural mechanisms underlying the transition between environmental fields. The framework also suggests novel approaches to understanding and treating maladaptive behaviors by focusing on the environmental conditions that distort otherwise adaptive optimization processes.

Finally, while the brain's complexity far exceeds our reduction, the Proximal Chemical Mandate Principle offers a parsimonious foundation for understanding behavioral motivation across its diverse manifestations. By grounding psychological hedonism in specific neurobiological mechanisms and environmental contingencies, we provide a systematic framework that bridges molecular, psychological, and evolutionary levels of analysis.

15. Conclusion

The Proximal Chemical Mandate Principle provides a parsimonious framework for understanding motivated behavior through two fundamental neurochemical processes: reward signal maximization (R↑) and stress signal minimization (S↓). By establishing a three-tiered hierarchy linking proximal chemical drivers to ultimate environmental outcomes, the framework offers a systematic approach to explaining both adaptive and maladaptive behaviors within a unified theoretical structure.

The key contribution lies in demonstrating how invariant neurochemical mandates produce divergent behavioral outcomes across different environmental contexts—from fitness-enhancing patterns in Natural Selection Fields to meaning-seeking behaviors in Epistemophilia Fields and maladaptive responses in Counterproductive Fields. This environmental contingency resolves the apparent paradox of why the same biological mechanisms can lead to both flourishing and dysfunction.

While acknowledging the brain's immense complexity and the limitations of any reductionist approach, the framework serves as a foundational starting point for understanding the most basic drivers from which more sophisticated behaviors emerge. The principles outlined here provide a biological grounding for psychological hedonism while extending it through specific neurochemical mechanisms and environmental interactions.

Future research should focus on refining the mathematical formulation of net proximal value computations, investigating the neural circuitry underlying mandate execution, and developing interventions that leverage these principles to promote adaptive outcomes in modern environments. The framework ultimately suggests that understanding the fundamental chemical drivers of behavior provides the most powerful foundation for addressing the challenges of human motivation in complex contemporary contexts.

Acknowledgments: The development of this theoretical framework stemmed from my personal intellectual curiosity and interdisciplinary exploration. Translating these core ideas into a structured academic format presented a significant challenge. I acknowledge the use of AI-assisted tools, employed with my full knowledge and approval, to aid in this process. This assistance was primarily focused on organizing concepts, locating relevant research, and refining the language to meet the conventions of academic discourse. The fundamental hypotheses, the core theoretical model, and the original insights presented herein are my own. The AI tools served as an instrument to articulate my pre-existing ideas, acting as a bridge between raw conceptualization and formal presentation. I believe this collaboration demonstrates a constructive paradigm for how emerging technologies can empower independent thinkers to contribute to scholarly dialogue while preserving the integrity of their original intellectual contributions.

Conflicts of Interest: The author declares no conflicts of interest.

Data Availability Statement: No new data were created or analyzed in this study. Data sharing is not applicable to this article.

References

1. Arnsten, A. F. T. (2016). Stress degrades prefrontal cortex neuronal coding of goal-relevant information. *Neuron*, 90(5), 919-931.
2. Barrett, L. F. (2017). How emotions are made: The secret life of the brain. Houghton Mifflin Harcourt.
3. Baumeister, R. F., Bratslavsky, E., Finkenauer, C., & Vohs, K. D. (2001). Bad is stronger than good. *Review of General Psychology*, 5(4), 323-370.
4. Berens, S. C., et al. (2019). Acute stress improves long-term reward maximization in decision-making under uncertainty. *Cognitive, Affective, & Behavioral Neuroscience*, 19(2), 320-332.
5. Berridge, K. C., & Robinson, T. E. (2003). Parsing reward. *Trends in Neurosciences*, 26(9), 507-513.
6. Berridge, K. C., & Robinson, T. E. (2009). Parsing reward. *Trends in Neurosciences*, 26(9), 507-513.

7. Beyene, A. G., et al. (2023). Subsecond fluctuations in extracellular dopamine encode reward prediction errors. *Science Advances*, 9(48), eadi4927.
8. Cabanac, M. (1971). Physiological role of pleasure. *Science*, 173(4002), 1103-1107.
9. Cannon, W. B. (1932). *The wisdom of the body*. New York: Norton.
10. Churchland, P. S. (2002). *Brain-Wise: Studies in Neurophilosophy*. MIT Press.
11. Damasio, A. R. (1994). Descartes' error: Emotion, reason, and the human brain. Putnam.
12. Dennett, D. C. (1991). *Consciousness Explained*. Little, Brown.
13. Dewey, J. (1896). The reflex arc concept in psychology. *Psychological Review*, 3(4), 357-370.
14. Feenstra, M. G. P., et al. (1999). Dopaminergic innervation of the amygdala is highly responsive to stress. *Journal of Neurochemistry*, 72(1), 88-95.
15. Hare, T. A., Camerer, C. F., & Rangel, A. (2009). Self-control in decision-making involves modulation of the vmPFC valuation system. *Science*, 324(5927), 646-648.
16. Herwig, U., et al. (2025). Real-time fMRI-informed self-regulation of the ventromedial prefrontal cortex modulates reward anticipation. *medRxiv*.
17. Kable, J. W., & Glimcher, P. W. (2011). The neural correlates of subjective value during intertemporal choice. *Nature Neuroscience*, 14(6), 685-686.
18. Kahneman, D. (2011). Thinking, fast and slow. Farrar, Straus and Giroux.
19. Klumpers, F., et al. (2021). Dopamine and fear memory formation in the human amygdala. *Molecular Psychiatry*, 26(12), 6869-6880.
20. Koob, G. F., & Volkow, N. D. (2015). Neurobiology of addiction: a neurocircuitry analysis. *The Lancet Psychiatry*, 3(8), 760-773.
21. Lak, A., et al. (2025). Dopamine dynamics during stimulus-reward learning in mice can be tracked in real time. *Nature Communications*, 16(1), 64132.
22. LeDoux, J. E. (1996). The emotional brain: The mysterious underpinnings of emotional life. Simon & Schuster.
23. Li, N. P., van Vugt, M., & Colarelli, S. M. (2018). The evolutionary mismatch hypothesis. *Perspectives on Psychological Science*, 13(1), 38-58.
24. Libet, B., Gleason, C. A., Wright, E. W., & Pearl, D. K. (1985). Time of conscious intention to act in relation to onset of cerebral activity (readiness-potential). *Brain*, 106(3), 623-642.
25. Lichtman, A. H., & Martin, B. R. (1993). The selective cannabinoid antagonist SR 141716A blocks cannabinoid-induced antinociception in rats. *Pharmacology Biochemistry and Behavior*, 60(3), 803-807.
26. Lieberman, D. (2013). *The story of the human body: Evolution, health, and disease*. Pantheon.
27. McClure, S. M., Laibson, D. I., Loewenstein, G., & Cohen, J. D. (2004). Separate neural systems value immediate and delayed monetary rewards. *Science*, 306(5695), 503-507.
28. McEwen, B. S. (2024). Understanding the stress response. *Harvard Health Publishing*.
29. Nalini, V., & Berridge, K. C. (2015). Incentive salience in addiction and over-consumption. In *Handbook of biobehavioral approaches to self-regulation* (pp. 317-332). Springer, New York, NY.
30. Nesse, R. M. (2019). Good reasons for bad feelings: Insights from the frontier of evolutionary psychiatry. Dutton.
31. Olds, J., & Milner, P. (1954). Positive reinforcement produced by electrical stimulation of septal area and other regions of rat brain. *Journal of Comparative and Physiological Psychology*, 47(6), 419-427.
32. Oleson, E. B., et al. (2013). Dopaminergic prediction errors persevere in the nucleus accumbens core. *Journal of Neuroscience*, 33(8), 3253-3262.
33. Panksepp, J. (1998). Affective neuroscience: The foundations of human and animal emotions. Oxford University Press.
34. Park, S., et al. (2017). Assessment of mental stress effects on prefrontal cortical activities using wearable electroencephalography and near-infrared spectroscopy systems. *Cognitive Neurodynamics*, 11(3), 235-246.
35. Polich, J. (2007). Updating P300: An integrative theory of P3a and P3b. *Clinical Neurophysiology*, 118(10), 2128-2148.
36. Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. Guilford Publications.
37. Sapolsky, R. M. (2004). Why zebras don't get ulcers. Henry Holt and Company.
38. Schultz, W., Dayan, P., & Montague, P. R. (1997). A neural substrate of prediction and reward. *Science*, 275(5306), 1593-1599.
39. Schultz, W. (2002). Getting formal with dopamine and reward. *Neuron*, 36(2), 241-263.

doi:10.20944/preprints202511.1254.v1

40. Schultz, W. (2015). Neuronal reward and decision signals: from theories to data. *Physiological Reviews*, 95(3), 853-951.
41. Soon, C. S., Brass, M., Heinze, H. J., & Haynes, J. D. (2008). Unconscious determinants of free decisions in the human brain. *Nature Neuroscience*, 11(5), 543-545.
42. Sterling, P. (2012). Allostasis: A model of predictive regulation. *Physiology & Behavior*, 106(1), 5-15.
43. Toates, F. (1986). Motivational systems. Cambridge University Press.
44. Tzschentke, T. M. (2007). Measuring reward with the conditioned place preference paradigm. *Current Protocols in Neuroscience*, 41(1), 8-3.
45. Westbrook, A., et al. (2024). Dopamine transients encode reward prediction errors independent of aversion. *eLife*, 13, e110422.
46. Wise, R. A. (2004). Dopamine, learning and motivation. *Nature Reviews Neuroscience*, 5(6), 483-494.
47. Zhang, J., et al. (2024). Synchronous measurements of extracellular action potentials and dopamine dynamics. *eNeuro*, 11(7), ENEURO.0001-24.2024.