Reward Trace Theory

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First public release of optimization formulation: December 08, 2025
This edition: December 16, 2025

GitHub repository: https://github.com/dirtyspaceship/reward-trace-theory

Core Claim

Reward Trace Theory (RTT) is a constrained optimization framework proposing that all sustained, effortful, socially-constituted human behavior emerges from the continuous optimization of trace-delivery mechanisms: the infrastructures, relationships, identities, beliefs, and practices that generate receiver-specific valuations on a signed scalar continuum (from extreme positive to extreme negative, with zero as affective indifference).
The organism does not optimize social relationships directly—it optimizes the mechanisms that deliver trace distance. Political identities, religious systems, ideological commitments, communities, and interpersonal bonds are trace-generation infrastructures, evaluated subpersonally for their capacity to maximize total weighted trace distance across a portfolio of receivers, subject to finite identity-level reorganization capacity.
Attraction (positive) and aversion (negative) are fully symmetric operations in process: the optimizer evaluates and selects mechanisms using identical logic regardless of sign, pushing valuations as far from zero as attainable equilibrium and scarcity allow. However, positive and negative mechanisms differ fundamentally in productivity and scalability: positive trace mechanisms scale more efficiently, sustain cooperation, and deliver superior long-term returns,

while negative/coercive mechanisms are costly to maintain, generate resistance, and typically collapse or require massive investment to sustain. Therefore, the observed distribution shows positive dominance not because the optimizer favors positive, but because positive mechanisms are superior trace-delivery technologies given the constraint structure of physical and social reality.

Information—whether propositional, observational, or experiential—is portfolio-relevant when it reveals new trace-delivery mechanisms, updates estimates of attainable extremity, or signals feasibility of mechanism-switching. The organism does not consciously decide to optimize—it automatically reorganizes in response to experienced trace intensity. What feels like deliberate choice is the narrative layer constructing socially-integrable explanations for allocation decisions that have already occurred subpersonally. Agency is real but resides in the optimization process, not the conscious narrator.
This inversion of the standard causal model—from narrative→behavior to trace-intensity→behavior→narrative—is essential to understanding why argument rarely changes behavior while mechanism-switching does. Conscious narratives provide post-hoc rationalizations for mechanism choices, varying culturally while the underlying optimization structure remains consistent.

The only objective fact is behavior, which directly reveals the trace portfolio allocation. All else —emotions, beliefs, intentions, narratives—are subjective and unobservable. Behavior cannot be "irrational" relative to the trace portfolio because behavior IS the portfolio allocation made visible. Every behavioral pattern, no matter how extreme or paradoxical, is rational evidence of the underlying trace portfolio structure given that person's unique, subjectively-constituted reality.

The "theory" is offered strictly as a hypothesis: a parsimonious generative model that aims to account for extreme and paradoxical phenomena (religious conversion, political radicalization, obsessive relationships, martyrdom, honor killings, addiction-recovery cycles, ideological purges), explain cross-cultural structural invariance amid narrative variability, and generate novel pre-registered predictions within its specified domain.

The Unified Observable Phenomenon
Attraction and aversion are the same process with opposite sign: involuntary, identity-level reorganization of a person's self-concept and entire future decision tree—both immediate and downstream—to optimize trace-delivery mechanisms that push receiver-specific valuations on a signed scalar continuum away from zero as far as possible, toward either their attainable positive maximum or attainable negative minimum.
What appears as "belief change," "identity formation," "social commitment," or "emotional attachment" is the behavioral signature of subpersonal mechanism evaluation and switching. The

optimizer continuously samples available trace-generation infrastructures and reallocates toward those offering superior weighted distance. The optimization process is sign-neutral: it evaluates mechanisms identically whether they generate positive or negative traces. However, positive mechanisms systematically outperform negative mechanisms in delivering sustained, scalable trace distance given the constraint structure of physical and social reality, resulting in their observed dominance in the distribution.

Domain Specification – The Null-Social-World Test
A behavior falls within RTT's domain if and only if both of the following are true:

> 1. Emotional-force condition: The behavior is accompanied by sustained emotional compulsion (urge, preoccupation, arousal, or distress) that feels identity-relevant and meaning-laden.
>
> 2. Social-constitution condition: In a hypothetical world where no other human (past, present, future, real, imagined, fictional, or internalized) ever existed or exerted valuation influence, that emotional compulsion and subjective meaning would collapse to near-zero intensity, even if the physical ability to perform the behavior remains unchanged.

If the emotional force and meaning of the behavior would persist at roughly the same level in this complete null-social world, the behavior is out-of-domain—no matter how effortful or reorganization-heavy it appears.

Why This Formulation

This test explicitly removes all possible sources of socially-constituted valuation (including internalized voices, cultural norms, divine judgment, imagined audiences, or abstract social receivers like "The Cause" or "Justice") while leaving non-social motives intact. It distinguishes the physical act from its emotional driver and handles edge cases such as:

• Exercise for endorphin rush (out-of-domain) versus exercise to maintain attractiveness for a partner (in-domain)
• Revenge against a deceased person (in-domain because the receiver is social)
• Eating when hungry (out of domain) versus going out to eat with friends (in domain/hybrid)

Practical Application Rule
When ambiguity remains, ask sequentially:

1. “If you knew with certainty that no other human—living, dead, future, imagined, or divine—could ever assign value, judgment, admiration, contempt, or meaning to this act, would the emotional urge and felt significance still be just as strong?”

2. If yes: “Would you still reorganize your life around it with the same intensity on a deserted island forever?”

Only behaviors where the emotional force collapses under both questions are in-domain.

In-Domain Examples (RTT applies):

- Parental sacrifice for a vegetative child (*positive extreme*)
- Religious martyrdom (positive extreme toward deity/cause, negative extreme toward apostasy/out-group)
- Stalking / obsessive ex-partner behavior (often +nuclear or –nuclear)
- Political identity commitment, ideological activism (±nuclear toward abstract and concrete receivers)
- Status competition, reputation management, honor killings (–extreme toward transgressor or their kin)
- Nationalism, ideological purges, charismatic followership (+extreme toward leader/cause,–extreme toward enemies/traitors)
- Suicide after incurable public shaming (–extreme self-trace triggered by social devaluation)
- Vendettas and blood feuds (sustained –extreme toward offending lineage)
- Murder-suicide in response to perceived betrayal (simultaneous –extreme toward betrayer and self)
- Religious conversion, political radicalization (mechanism-switching for superior trace delivery)
- Addiction recovery → counseling pipeline (mechanism substitution)
- Cult membership and exit → anti-cult activism (sign inversion via mechanism switch)

Out-of-Domain Examples (RTT makes no claim):

- Habitual tooth-brushing
- Eating when hungry
- Solitary mathematical proof-grinding for intrinsic beauty
- Daily exercise purely for endorphin rush or longevity
- Collecting rare stamps in total isolation for aesthetic pleasure

Interaction with Out-of-Domain Behavior

RTT proposes that the trace-optimization system is ONE of multiple subpersonal behavioral control systems, not the only one. The organism contains:

- Homeostatic systems (hunger, thirst, sleep, temperature regulation)
- Pain-avoidance systems (threat detection, withdrawal reflexes)
- Habit systems (procedural learning, automaticity)
- Intrinsic reward systems (aesthetic pleasure, curiosity, mastery)
- Trace-optimization system (social reward-seeking via mechanism allocation)

All of these operate subpersonally and automatically. None are under direct conscious control, though conscious simulation can provide information input to them.
The conscious narrative rationalizes outputs from ALL subsystems, not just the trace-optimizer:

- "I'm eating because I'm hungry" (homeostatic)
- "I brush my teeth because it's healthy" (habit + pain-avoidance)
- "I solve math problems because they're beautiful" (intrinsic reward)
- "I devote myself to my children because I love them" (trace-optimization)

RTT remains silent on the control mechanisms of out-of-domain systems. It only claims that within its specified domain (sustained, effortful, socially-constituted behavior passing the null-social-world test), the trace-optimization system governs behavioral allocation.

Subsystem Interaction

Out-of-domain behaviors can interact with trace-optimization in several ways:

1. Capacity sharing: All subsystems compete for finite resources (time, energy, attention). A person maintaining homeostatic functions, habit routines, AND nuclear trace-mechanisms experiences total capacity constraint across all systems.

2. Instrumental recruitment: The trace-optimizer can exploit out-of-domain behaviors when they enhance trace-delivery. Exercise motivated purely by endorphins (out-of-domain) may be reinforced by trace-optimizer if it increases attractiveness to a romantic partner (in-domain). The behavior serves both systems simultaneously.

3. Mechanism conversion: An initially out-of-domain behavior can BECOME in-domain if it acquires emotional force that survives the null-social-world test. Solitary math for beauty (out-of-domain) becomes trace-driven if the person begins experiencing it as "impressing an internalized mentor" or "contributing to the mathematical community."

4. Narrative blending: The conscious narrator often conflates outputs from multiple systems into unified stories. "I exercise because I value health AND want to look good for my partner" may describe simultaneous homeostatic, pain-avoidance, AND trace-optimization motivations.

Critical boundary: If you remove all social receivers (past, present, future, real, imagined, internalized) and the behavior's emotional force collapses, it was in-domain. If emotional force persists at similar intensity, it was out-of-domain—even if trace-optimization occasionally exploited it instrumentally.

Implications for the Strong Claim

With this boundary, RTT proposes that sustained, effortful behavior passing the null-social-world test can be understood as the (approximate) solution to a constrained optimization problem: continuous evaluation and switching of trace-delivery mechanisms to maximize receiver-specific valuations on a signed scalar continuum, subject to finite reorganization capacity.

Hybrid Cases and Subsystem Interaction

Many behaviors receive contributions from multiple subsystems:
Example 1: The Daily Runner

• Pure endorphin-seeking (out-of-domain): Would still run on deserted island with identical emotional force
• Status maintenance (in-domain): Would stop running if no social receivers existed to value fitness
• Hybrid case: Most runners experience BOTH. Removing social receivers would reduce emotional force but not eliminate it entirely.

RTT predicts: Trace-optimization component should show distinctive markers (receiver-specificity, escalation under social threat, mechanism-switching when superior social alternatives appear) while endorphin component shows different dynamics (dose-response to exercise intensity, independent of social feedback).

Example 2: The Devoted Researcher

• Pure intellectual curiosity (out-of-domain): Would still pursue research on deserted island for beauty of discovery
• Academic recognition (in-domain): Would reduce effort if no community existed to value the work
• Hybrid case: Most researchers experience BOTH.

RTT predicts: The trace-component explains: publication pressure, conference attendance, competitive dynamics, devastation when work is ignored, elation when cited. The curiosity-component explains: continued work during academic isolation, pursuit of unfashionable problems, satisfaction from private breakthroughs.

The null-social-world test isolates trace-driven components from other motivational systems. Behaviors rarely fall cleanly into one category—most are hybrid. RTT makes predictions specifically about the trace-optimization component, remaining silent on contributions from other systems.

Formal Statement

The organism continuously attempts to optimize trace-delivery mechanisms—the identities, relationships, beliefs, communities, and practices that generate receiver-specific valuations on a signed scalar continuum—so as to maximize total weighted distance of those valuations from affective zero, subject to the hard scarcity constraint of finite identity-level reorganization Capacity.

"Trace" is deliberately substrate-neutral: it refers to the experienced intensity of receiver-specific valuation, regardless of whether that experience is implemented neurochemically (dopamine, oxytocin), phenomenologically (felt valuation), socially (others' regard), or behaviorally (revealed preference). The optimizer evaluates "how far from zero is this mechanism pushing receiver-specific valuation" without distinguishing substrate—just as economic value operates independently of whether exchange uses shells, gold, or Bitcoin.

Trace-delivery mechanisms are evaluated subpersonally through direct reinforcement—the organism experiences trace intensity from others' valuations and automatically reorganizes toward whatever generates stronger sensations. There is no sophisticated cost-benefit calculation; the organism simply follows the gradient of experienced trace intensity, much as a plant grows toward light without "evaluating" photon sources.

What appears as mechanism "evaluation criteria" are actually descriptions of properties that cause mechanisms to attract allocation through pure reinforcement dynamics:

1. *Attainable extremity*: Mechanisms generating stronger trace sensations automatically attract more allocation

2. *Reliability:* Mechanisms delivering consistent sensations naturally reinforce stable allocation

3. Synergy: Mechanisms that amplify each other's sensations create portfolio clustering through mutual reinforcement

4. Cost: Mechanisms exhausting capacity naturally constrain further allocation

5. Accessibility: Mechanisms delivering immediate sensation are preferentially reinforced

6. Scalability: Mechanisms sustaining sensation over time naturally dominate long-term Portfolios

The optimizer continuously samples available mechanisms through direct experience of their trace-delivery, and behavioral allocation shifts automatically toward those generating superior weighted distance. What appears as sudden "conversion," "identity change," or "emotional breakthrough" is the behavioral signature of mechanism-switching when a newly-discovered or newly-available infrastructure delivers trace intensity that triggers reallocation cascade.

The evaluation process is sign-neutral—the organism reinforces mechanisms identically whether they generate positive or negative trace sensations. However, positive mechanisms systematically exhibit superior scalability, sustainability, and self-reinforcing properties given the constraint structure of physical and social reality, resulting in their dominance in observed portfolios. Negative/coercive mechanisms persist only in specific conditions: when positive mechanisms are foreclosed, when short-term negative mechanisms offer higher immediate magnitude, or when cultural/structural constraints sustain them despite their inefficiency.

Synergistic mechanisms amplify one another's effective value through mutual reinforcement; subtractive mechanisms suppress or foreclose competitors. Receiver-specific motivational stress is the phenomenal readout of momentary deviation from a mechanism's current effort-based equilibrium position—the felt cost when current distance falls short of what continued reorganization could attain, or when a superior mechanism has been discovered but not yet adopted, regardless of whether the equilibrium is positive or negative.

The five diagnostic markers, protective cascades, heavy-tailed extremity distribution, escalation under threat, foreclosure dynamics, sign inversion, and U-shaped volatility across the continuum all emerge as properties of mechanism optimization under scarcity.

Equilibrium Dynamics and Receiver-Specific Motivational Stress

Most trace-delivery mechanisms reach stable, modest equilibria far from nuclear intensity because the marginal reorganizational effort required to extract additional distance ceases to justify the expected return.

Each mechanism has a dynamic equilibrium position determined by the balance between (a) the trace-generation potential that continued investment could unlock and (b) the escalating reorganizational cost of that investment under finite capacity. As allocation to a mechanism increases, diminishing returns typically set in: early adoption yields large distance gains, but pushing beyond moderate levels requires disproportionately larger sacrifices for ever-smaller incremental returns.

General physiological stress (cortisol, norepinephrine, autonomic arousal) is a non-specific mobilization resource that the optimizer recruits for any costly action, including out-of-domain Behaviors.

In contrast, receiver-specific motivational stress is the phenomenal readout unique to in-domain mechanisms: the acute, identity-relevant tension experienced when:

- Current trace distance falls below the equilibrium attainable with feasible reorganization for that particular receiver,

OR

- A superior trace-delivery mechanism has been discovered but adoption is blocked or incomplete

This stress is symmetric across positive and negative poles. Threats to revert a highly positive trace toward zero (loss of a child's love) and threats to revert a highly negative trace toward zero (forgiveness or impunity for a betrayer) both register as intolerable gaps, triggering identical protective cascades—intrusive rumination, physiological mobilization, escalation to coercion or violence, and, at the limit, foreclosure (including self-erasure when a permanently negative extreme self-trace is induced). Negative nuclear traces explain phenomena that appear especially paradoxical under positive-only frameworks: sustained vendettas that outlast lifetimes, murder-suicide pacts, terrorist acts against out-groups, and suicidal revenge.

In each case, the optimizer rationally monopolizes capacity to maintain a mechanism delivering receiver-specific valuation at its attainable negative minimum, treating any movement back toward zero (reconciliation, forgiveness, or oblivion) as the functional equivalent of losing a beloved child. This equilibrium logic explains the observed distribution without additional assumptions: Thousands of mechanisms remain mild and stable; a handful achieve monopoly and nuclear intensity—positive or negative—when their attainable equilibrium vastly outweighs the reorganizational price.

Volatility Across the Signed Continuum

Emotional and behavioral stability follows a U-shaped pattern across the continuum, with high volatility near zero, relative steadiness in the moderate range, and renewed volatility at the nuclear tails.

Near zero (indifference): Mechanisms command minimal allocation and shallow equilibria. Minor feedback easily shifts position or sign, producing high emotional/sign volatility—fleeting likings, casual dislikes, "take it or leave it" attitudes. Behavior remains low-cost and reversible. Mechanism-switching is frequent and low-stakes.

Moderate intensity: Deeper equilibria justify consistent allocation. Valuation feels steady and proportionate ("reliable friend," "committed but not obsessive partner"), with predictable behavior and emotional tone. Mechanisms are stable and generate consistent returns.

Nuclear tails (extreme ±intensity): Ultra-deep equilibria combined with monopoly produce high behavioral volatility under perturbation. Tiny threats trigger massive responses—escalation, foreclosure, or sign inversion—as the optimizer desperately preserves magnitude. What appears "irrational" (sudden mechanism-switching, self-sacrifice, vengeful obsession) is intensity-protecting extremism when reversion toward zero would collapse most portfolio value.

This U-shaped volatility arises naturally from the interplay of equilibrium depth, diminishing returns, and scarcity: shallow mechanisms allow easy substitution near indifference; moderate mechanisms support stability; the deepest mechanisms are brittle, risking catastrophic loss from small disruptions or the discovery of superior alternatives.

Evolutionary Foundation

Human psychology was shaped by selection pressures in small-to-medium ancestral social groups where survival and reproduction depended heavily on cooperative and competitive access to resources mediated by others rather than on solitary effort. The core adaptation is a domain-general mechanism for generating and responding to intense social valuation

(reward-trace intensity) across diverse relationship types—parent-child, romantic, leader-follower, coalitional, ideological, and beyond. This system operates by continuously evaluating and optimizing trace-delivery mechanisms: the social infrastructures that generate receiver-specific valuations.

Sexual reproduction is one powerful application of this broader mechanism (creating new receivers predisposed to form extreme traces toward the parent), but the primary selection pressure was the ability to identify, adopt, and switch between trace-generation infrastructures that induce high reward-trace distance in others, as this provided the most reliable route to leveraged fitness benefits.

Individuals with superior mechanism-evaluation faculties—those who could identify which social structures, roles, ideologies, and relationships offered the highest trace-generation capacity—induced greater reward-trace distance in others. Others, in turn, reorganized their own lives around the successful trace-generator, granting leveraged access to food, protection, mating opportunities, coalition support, information, and meaning—benefits that are orders of magnitude less costly than attempting to produce them entirely alone.

Scarcity makes extreme self-sufficiency prohibitively expensive or impossible; effective trace-delivery mechanisms are the only scalable solution. Critically, selection favored individuals who discovered and adopted positive trace-generation mechanisms because these mechanisms, given the constraint structure of physical and social reality:

- Scale efficiently across multiple receivers (cooperation doesn't require dedicated monitoring per receiver)
- Generate reciprocal positive traces (self-reinforcing cooperation through mutual benefit)
- Sustain over long durations without constant enforcement (trust compounds rather than depletes)
- Enable coordination and coalition formation (shared positive valuations align incentives)
- Require lower maintenance costs than coercive alternatives (voluntary cooperation vs. forced compliance)

Negative/coercive mechanisms were selected against except in specific niches because they:

- Require constant monitoring and enforcement (information bottleneck, attention scarcity)
- Generate resistance, defection, and retaliation (active opposition rather than cooperation)
- Exhaust reorganization capacity rapidly (unsustainable energy expenditure)
- Collapse without sustained investment (no self-reinforcing dynamics)
- Scale poorly beyond immediate control (can't extend across large populations or time)

However, the optimization algorithm itself evolved to be sign-neutral because:

- Foreclosure scenarios sometimes leave negative mechanisms as the only option
- Sign inversion must be available as a portfolio-preserving strategy
- Environmental variability required flexibility to handle both signs

The result: An optimizer that evaluates mechanisms identically regardless of sign through direct reinforcement of experienced trace intensity, but systematically discovers through environmental feedback that positive mechanisms deliver superior returns given the constraint structure of Reality.

Ultimate vs. Proximate Currency: Mechanism Optimization as the Core Adaptation

The ultimate evolutionary currency remains inclusive fitness, but the proximate mechanism selection shaped—and that human psychology now optimizes—is the identification, adoption, and switching of trace-delivery mechanisms that maximize the magnitude and reliability of reward-trace intensity generated in others across diverse social domains.

Standard evolutionary psychology often treats sexual/romantic attraction as the foundational adaptation, with other bonds (parental, coalitional, charismatic) as derivatives or exaptations. RTT inverts this hierarchy: a general-capacity mechanism-evaluation system evolved first because adopting effective trace-generation infrastructures was the key fitness bottleneck in social species. Sexual pair-bonding is a specialized instance of this broader system, not its origin. This reframing helps account for multiple paradoxes:

- Shared neurochemistry (oxytocin-dopamine pathways) across parental, romantic, ideological, and other bonds is expected, not convergent evolution—all are applications of the same mechanism-optimization system.

- Parasocial attachments, charismatic followership, and posthumous reputation management
are adaptive uses of the mechanism, not mismatches—they represent effective trace-delivery infrastructures.

- Revenge against deceased enemies or lifelong celibacy for ideology becomes rational optimization of trace-generation mechanisms that offer nuclear intensity.

- Self-destructive extremes (martyrdom, honor suicide) can generate nuclear or posthumous traces via mechanism-adoption that dwarf direct reproductive routes.

- Sudden ideological conversion, political radicalization, and religious transformation are mechanism-switching events when newly-discovered infrastructures offer superior trace-generation capacity.

Neuroscience supports domain-generality: oxytocin and dopamine systems underlie maternal nurturing, romantic pair-bonding, friendship, and broader affiliation, with substantial overlap in reward circuitry across relationship types. These systems respond to trace-delivery mechanism effectiveness, not specific relationship categories.

Speculative Implication: A Domestication Hypothesis

The domestication syndrome (neoteny, low reactivity, imprinting windows, play into adulthood) is a mutual trace-subsidy package. Species that lower the effort cost of generating nuclear traces in humans—and reciprocate—were domesticated. Humans self-selected for the same traits, producing our own neoteny and vastly expanded trace-generation mechanism capacity.

Dogs, cats, and other domesticates function as reliable, low-cost trace-delivery mechanisms: they generate consistent positive traces with minimal reorganization cost. This may constitute the decisive psychological discontinuity between Homo sapiens and all other species: the capacity to identify, evaluate, and continuously optimize across an unprecedented range of trace-generation infrastructures, from interpersonal relationships to abstract ideological systems.

Information, Mechanism Discovery, and Optimization

The optimization process operates subpersonally through direct reinforcement: the organism experiences trace intensity and automatically reorganizes toward sensation sources. There is no conscious access to the full portfolio of trace values, mechanism quality estimates, interaction weights, or marginal returns—these are post-hoc narrative constructions, not causal inputs to the Optimization.

Information—whether propositional, observational, or experiential—is portfolio-relevant when it enables the organism to sample new trace-delivery mechanisms and experience their intensity directly. Information does not "update estimates" through conscious calculation—it changes which mechanisms the organism is exposed to, therefore which trace sensations it experiences, therefore what behavioral patterns get reinforced.
Information reveals:

1. New trace-delivery mechanisms previously unknown or inaccessible (exposure to community, ideology, relationship type)

2. Direct sampling opportunities for mechanisms the organism hasn't experienced (invitation to join group, introduction to person, exposure to practice)

3. Behavioral demonstrations of mechanism effectiveness (observing others receiving high-magnitude traces from specific infrastructures)

4. Access pathways that make mechanism-switching feasible given current constraints (how to join, what's required, who can help)

Information is not portfolio-relevant when it consists of:

- Abstract facts with no trace-generation implications
- Narratives about mechanisms the person cannot access or sample
- Propositional claims unconnected to behavioral demonstration of mechanism effectiveness
- Content that doesn't enable direct experience of trace intensity

Why "Learning New Information" Causes Identity Change

What appears as "belief change" or "ideological conversion" after exposure to new information is actually the subpersonal optimizer discovering and switching to a superior trace-delivery mechanism through direct sampling and reinforcement.

Example: Political conversion

Before:
- Person allocated to Democratic identity (moderate positive reward trace via Democratic community mechanism)
- Unaware that Republican identity could offer higher attainable extremity
- Portfolio appears optimized given known mechanisms

Information exposure:
- Reads article, watches video, has conversation revealing that Republican community exists
- Critical step: Information enables SAMPLING—person attends Republican event, experiences direct trace intensity
- Experiences: Nuclear belonging (+), clearer identity (+), stronger in-group/out-group distinctions (synergistic amplification), accessible local community
- Direct synergistic reinforcement: Republican mechanism delivers stronger trace sensation than Democratic mechanism

After:
• Reorganizes toward Republican identity
• Not because Democratic pathway was "foreclosed"—it's still available
• But because direct experience of Republican mechanism delivered superior trace intensity
• The flip is entrepreneurial discovery through sampling of a better infrastructure

The person experiences this as "I learned the truth and changed my mind." RTT says:

Information enabled you to sample the Republican mechanism; you experienced superior trace intensity; your subpersonal optimizer executed automatic reallocation through reinforcement. This explains why:

• Conversion is sudden: Switching mechanisms through direct reinforcement, not gradually updating beliefs
• Converts are most extreme: Selected mechanism specifically through sampling for high-extremity delivery
• Narrative inverts completely: New mechanism requires new rationalization
• Logical contradictions don't matter: Optimizer selects for experienced trace intensity, not propositional coherence
• Same information, different outcomes: Mechanism accessibility and experienced trace intensity vary by person (subjective valuation)
• Argument fails but exposure works: Arguments don't cause sampling; direct exposure to mechanisms enables sampling and therefore reinforcement

Information's causal role is enabling mechanism sampling, not persuading through reasoning. The organism must directly experience trace intensity from a mechanism for reallocation to occur. This is why:

> • Reading about Christianity doesn't convert—visiting a Christian community and experiencing trace intensity does
> • Hearing about addiction recovery doesn't work—attending a recovery meeting and experiencing belonging/purpose does
> • Learning logical arguments for political positions fails—joining the community and experiencing identity/solidarity works

The narrative content of information is largely causally inert. What matters is whether information enables the organism to sample mechanisms and experience their trace-delivery capacity directly.

Narrative Rationalization

When powerful mechanism-switches occur—especially involving nuclear intensity—the conscious mind experiences the resulting motivational forces as overwhelming urges, revelations, or callings, and generates post-hoc narratives to explain them. These explanations draw on culturally available templates (honor, sacred duty, eternal love, revolutionary justice, divine calling) but have limited causal role in driving the underlying optimization.

Conscious Rationalization of Subconsciously Optimized Mechanisms

Trace-delivery mechanisms—the infrastructures that generate receiver-specific valuations on a signed scalar continuum—are evaluated and selected subconsciously through direct reinforcement of experienced trace intensity. The conscious self rationalizes these subconscious optimization decisions by embedding them in rhetorical frameworks:

- Pre-hoc anticipations: “This is my sacred calling,” “I’ve always known I was meant for This”

- Post-hoc justifications: “I had no choice; it was fate,” “God revealed the truth to me”

- Narrative inversions: “I never really believed the old way,” “They were always evil, I just couldn’t see it”

These narratives portray mechanism-adoption as deliberate, meaningful choice rather than emergent optimization through automatic reinforcement in response to experienced trace Intensity.

Behavior, however, is the only truly logical aspect: it coherently reflects the optimizer’s solution to the scarcity-constrained problem, adopting and switching mechanisms to push traces toward their equilibria with maximal efficiency.

Rhetorical explanations are non-causal embellishments that serve social signaling, self-coherence, or cultural conformity. They may precede behavior as motivational priming or follow as retrospective sense-making, but they do not alter the underlying mechanism-evaluation dynamics driven by direct reinforcement. This rationalization process explains why individuals often describe their commitments in absolutist, illogical terms that feel profoundly true yet fail logical scrutiny: the subconscious mechanism-optimization is a raw, efficiency-driven reinforcement process; the conscious rhetoric drapes it in narrative clothing to make it palatable or defensible. Behavior alone reveals the mechanism’s true value—through disproportionate allocation, foreclosure of alternatives, and cascade responses—unmediated by words.

Cross-Cultural Pattern

Behavioral signatures (intrusive preoccupation, escalation under threat, foreclosure of alternatives, extreme costs, physiological arousal, sudden mechanism-switching) are consistent because they stem directly from the optimizer and the structural properties of mechanism-evaluation under scarcity through reinforcement learning.

Narrative content varies because it is shaped by local cultural resources—the available templates for explaining trace-generation: karma, divine will, historical materialism, evolutionary psychology, market efficiency, etc. Apparent irrationality in extreme motivation often reflects the mismatch between coherent subpersonal mechanism-optimization through reinforcement and the logically loose or magical stories used to justify it.

The Locus of Agency

The conscious narrative experiences itself as the decision-maker, deliberating among options and choosing actions based on reasons. This phenomenology is genuine—the experience of agency is real—but the causal structure is inverted from how it feels.

Agency exists at the subpersonal level. The organism genuinely chooses which mechanisms to allocate toward, when to switch, whether to invert signs, and when to foreclose. These are real decisions with real consequences, enacted through automatic reorganization in response to experienced trace intensity. The conscious narrative does not control these allocation decisions. Its function is social integration: generating post-hoc explanations that embed trace-driven behavior in culturally- legible frameworks, enabling coordination with others who also require narrative justification for behavioral patterns.

This is not a loss of agency—it is a relocation of agency from the narrative layer (where subjective experience resides) to the optimization layer (where behavioral allocation occurs through reinforcement).

Why This Feels Like Loss of Free Will

The phenomenology of deliberation—weighing options, considering reasons, "making a decision"—constructs itself in real-time as subpersonal reallocation occurs through reinforcement. The narrative layer experiences temporal precedence (thoughts→decision→action) when the actual causal sequence is: trace intensity evaluation (subpersonal, automatic) → reinforcement-driven reorganization (behavioral) → narrative construction (conscious).

Because subjective experience identifies with the conscious narrator rather than the subpersonal optimizer, relocating agency to the optimization layer feels like eliminating agency altogether. But the organism still performs genuine valuation (subjective experience of trace intensity), selection (automatic reinforcement of high-intensity mechanisms), and allocation (behavioral reorganization)—the core components of choice.

The choice is real. It simply operates through direct reinforcement learning in response to experienced trace intensity, not through conscious deliberation.

Why Narrative Isn't Causal (But Still Matters)

The narrative layer serves critical functions:

- Social coordination: Explains behavior in shared cultural frameworks, enabling others to predict and cooperate

- Mechanism discovery: Exposure to new narratives can reveal new trace-delivery infrastructures available for sampling

- Simulation: Modeling future scenarios provides information input that may bias which mechanisms organism samples

- Identity continuity: Maintains coherent self-concept across mechanism switches

- Meaning-making: Generates phenomenological significance from trace experiences

But these functions operate through information pathways that enable mechanism sampling, not direct behavioral control. A compelling narrative about Christianity doesn't cause conversion by persuasion—it reveals the Christian community mechanism, enabling the organism to sample it and experience its trace intensity, which may trigger automatic reallocation if intensity is superior. This explains why argument rarely changes nuclear commitments: arguments target the narrative layer, but behavior is determined by experienced trace intensity at the optimization layer, accessible only through direct mechanism sampling.

We Are Storytelling Animals

Humans evolved ultrasociality requiring unprecedented coordination. The narrative layer is the social interface device that makes trace-driven behavior explicable to others operating in complex normative environments.

Other social animals optimize trace-delivery mechanisms without narrative overlay:

- Dogs form nuclear attachments (parent-surrogate bonds)
- Primates compete for status (trace-delivery through dominance)
- Elephants maintain long-term relationships (cooperative trace-generation)

Humans added the story layer to enable:

- Coordination at scale (shared narratives → shared norms)

- Abstract receivers (gods, nations, causes existing only in narrative but delivering real experienced traces)

- Cultural evolution (mechanism-knowledge transmitted through stories that enable sampling)

- Infinite mechanism diversity (same underlying reinforcement process, unlimited narrative framings)

We experience ourselves as protagonists making meaningful choices. The meaning is real, the choices are real—but the choosing happens where trace intensity is evaluated and reinforced, not where stories are told.

Multiple Control Systems, Single Narrative

The trace-optimization system is not the only subpersonal controller of behavior. The organism contains multiple automatic subsystems (homeostatic, habit, intrinsic-reward, pain-avoidance, AND trace-optimization), each operating without conscious control through their own reinforcement mechanisms. The conscious narrative integrates outputs from ALL subsystems into a unified story of "my choices" and "my reasons." This creates the phenomenology of unified agency even though behavioral control is distributed across multiple specialized systems, each responding to different types of experienced reinforcement.

When you "decide" to eat lunch, multiple systems contribute:

- Homeostatic hunger signals (physiological reinforcement)
- Habit (procedural reinforcement of lunchtime routine)
- Trace-optimization (social meal with friends delivers trace reinforcement)
- Intrinsic reward (enjoying food flavors provides hedonic reinforcement)

The narrative constructs: “I chose to have lunch with friends because I was hungry and wanted to catch up.”

Multiple subsystems generated outputs (hunger signal, habit activation, trace-opportunity detection, flavor anticipation), behavioral allocation reflected their combined influence through parallel reinforcement processes, and narrative post-hoc integrated them into coherent explanation.

RTT’s claim: Within socially-constituted behavior passing the null-social-world test, the trace-optimization system is the primary controller through reinforcement of experienced trace intensity. For out-of-domain behaviors, other subsystems govern through their respective reinforcement mechanisms. The narrative integrates both but controls neither.

Implications for Intervention

Standard approach (often ineffective): Try to change behavior by changing narratives
• “Think differently about X”
• “Believe Y instead of Z”
• “Understand why your behavior is harmful”

RTT approach (more effective): Change behavior by changing which mechanisms deliver experienced trace intensity

- Provide superior alternative mechanisms for direct sampling
- Alter environment to change which mechanisms organism can experience
- Reduce barriers to mechanism-switching (enable direct access to alternatives)
- Build capacity for reallocation

Narrative interventions work only when they enable mechanism sampling or provide information about mechanism accessibility, not through persuasion or reasoning alone. The organism must directly experience superior trace intensity from an alternative mechanism for reallocation to occur.

Key Structural Consequences

Nuclear Concentration and Heavy-Tailed Extremity

Nuclear concentration and heavy-tailed extremity arise inevitably from scarcity, diminishing returns, and mechanism interactions through reinforcement learning. Most mechanisms remain at moderate equilibria; a few achieve high intensity when their experienced trace intensity vastly outweighs alternatives, creating positive feedback loops through repeated reinforcement.

Positive nuclear mechanisms are more common because positive trace-delivery technologies scale better through self-reinforcing cooperation, sustain over time without constant enforcement, and deliver consistent reinforcement. Negative nuclear mechanisms persist in specific conditions: foreclosed positive options, cultural honor systems requiring coercion, abusive relationships with exit barriers, vendettas when restoration is impossible.

Escalation Under Threat

The optimal defense of high-value mechanisms, whether positively or negatively valenced. When a nuclear mechanism is threatened, the optimizer escalates behavioral investment to protect trace distance—regardless of apparent "rationality" of the response. This occurs automatically through the organism's response to threatened loss of high-intensity reinforcement source. Process is identical for positive and negative mechanisms, but positive mechanisms typically face fewer existential threats due to their self-reinforcing nature.

Foreclosure

The rational solution when a mechanism monopolizes capacity and no feasible action can maintain distance. Explains self-destructive revenge and murder-suicide as readily as sacrificial devotion. When a nuclear mechanism becomes permanently unavailable and no substitute exists capable of delivering equivalent trace intensity, the optimizer may execute self-erasure as the only remaining option.

Foreclosure is more common with negative nuclear mechanisms because they lack the redundancy and substitutability of positive mechanisms. Positive portfolios typically contain multiple overlapping mechanisms capable of delivering traces; negative portfolios often concentrate on single targets whose removal forecloses the entire system.

Synergistic and Subtractive Mechanisms

Yield superlinear joint returns (religious community + ideological cause amplify each other's trace intensity) or trigger winner-take-all dynamics (competing romantic interests). The optimizer preferentially adopts synergistic mechanisms through mutual reinforcement amplification and abandons subtractive ones through interference effects.

Positive mechanisms exhibit higher synergy potential: cooperation amplifies cooperation through reciprocal reinforcement, trust generates trust through repeated positive experiences, shared identity strengthens bonds through collective reinforcement. Negative mechanisms more often compete: hatred toward target A may interfere with hatred toward target B through capacity constraints; coercion in one domain may undermine control in another through resistance generation.

Protective Cascades

The monitoring, mobilization, and execution mechanisms required for maintaining high-value mechanisms near their attainable extrema, producing identical behavioral signatures for love and hate: intrusive preoccupation, physiological stress, behavioral escalation, and willingness to foreclose alternatives. These cascades operate identically regardless of sign—this is the clearest evidence of process symmetry. A parent defending their child and a vendetta-holder pursuing revenge show the same behavioral patterns, physiological arousal, and escalation trajectories because both are responding to threats to high-intensity reinforcement sources through identical protective mechanisms.

Sign Inversion as Optimal Mechanism-Switching

When a nuclear mechanism's equilibrium becomes unattainable in its current direction and reversion toward zero threatens the portfolio's total distance, the optimizer can protect scalar intensity by inverting the sign and adopting a mechanism that pushes toward the opposite Extreme.

This occurs not through conscious decision but through automatic reinforcement: the blocked mechanism stops delivering trace intensity → organism experiences loss → seeks ANY high-magnitude sensation → opposite-sign mechanism available and sampled → delivers high intensity → automatic reinforcement of inverted pathway.

This is frequently the highest-value move because the opposite pole often offers greater attainable extremity than continuing with the blocked mechanism: the original feedback channel is exhausted or permanently closed, while the inverted channel unlocks fresh, high-magnitude

social signals (posthumous honor, divine forgiveness, eternal condemnation, redeemed devotion, ideological purification) that the organism can directly experience. Sign inversion is mechanism-substitution: abandoning a blocked infrastructure and adopting one that delivers equivalent or superior trace distance in the opposite direction through direct reinforcement of the new pathway. Inversion thus transforms an intolerable magnitude loss into a new nuclear commitment, preserving or even increasing weighted distance at lower cost. Sign inversion is therefore a predicted protective cascade: sudden, total, and accompanied by narrative overhaul to justify the switch ("I never loved them," "They revealed their true evil," "God has shown me the light," "The revolution betrayed its principles"). It explains:

- Rapid love-to-hate shifts in obsessive relationships
- Murder-suicide pacts where betrayal flips to "eternal union"
- Religious/political conversions under defeat (extreme enemy becomes extreme savior)
- Posthumous reputation reversals
- Ex-cult members becoming anti-cult activists
- Recovered addicts becoming addiction counselors

Positive-to-negative and negative-to-positive inversions are fully symmetric in process through identical reinforcement mechanisms; the optimizer is indifferent to sign and automatically reinforces whichever mechanism delivers maximum |r| under updated constraints. However, negative-to-positive inversions are typically more stable because positive mechanisms offer superior long-term scalability and self-reinforcement once adopted.

U-Shaped Volatility and Mechanism Stability

Near zero: high mechanism-switching frequency, low commitment, easy substitution through weak reinforcement

Moderate intensity: stable mechanism adoption, proportionate investment, consistent reinforcement

Nuclear tails: high sensitivity to mechanism threats, intensity- preserving extremism, protective responses to threats to high-intensity reinforcement sources

Diagnostic Markers

Derived from the mechanism-optimization structure:

1. Strict receiver-specificity: Behavior targets particular social entities (real, imagined, abstract) as sources of experienced trace intensity

2. Bidirectional extremity possible: Same receiver can elicit sign inversion over time via mechanism-switching when reinforcement contingencies change

3. Intrusive preoccupation: Optimal monitoring of high-value reinforcement sources

4. Receiver-specific motivational stress: Physiological arousal under threat to high-intensity reinforcement sources (symmetric across sign)

5. Escalation, foreclosure, or sign inversion when blocked: Automatic response when mechanism becomes infeasible or inferior alternative is discovered and sampled

Paradox-Dissolving Worked Examples

All extreme phenomena dissolve into straightforward mechanism-optimization solutions:

Religious Conversion
Observed phenomenon: Person raised atheist suddenly converts to evangelical Christianity with nuclear intensity.

RTT explanation: Atheist identity offered moderate trace delivery → exposure enabled sampling of evangelical community → direct experience of nuclear trace intensity (belonging, purpose, divine approval, clear identity) → automatic reinforcement executed mechanism-switch. Positive mechanism offered superior scalability and synergy through self-reinforcing community dynamics compared to previous allocation.

Political Radicalization
Observed phenomenon: Moderate liberal becomes radical activist after consuming online Content.

RTT explanation: Online content revealed radical activism mechanism enabling sampling → direct experience through community engagement delivered vastly higher trace intensity → automatic mechanism-switch executed through reinforcement. Positive mechanism components (in-group belonging, clear identity, moral certainty) outcompeted previous moderate allocation through stronger experienced reinforcement.

Love-to-Hate Inversion (Obsessive Relationship)
Observed phenomenon: Intense romantic devotion flips to intense hatred after breakup.

RTT explanation: Breakup foreclosed positive mechanism (no more positive trace reinforcement)

→ negative mechanism preserves magnitude at lower cost through different reinforcement source (satisfaction from revenge, validation from moral superiority) → sign inversion executed automatically through reinforcement of available high-intensity alternatives. Process is identical for both signs through reinforcement learning; intensity preserved through substitution.

Cult Membership and Exit
Observed phenomenon: Person joins cult with total devotion, later exits and becomes anti-cult activist with equal intensity.

RTT explanation: Cult offered nuclear positive package → direct experience of intense belonging, purpose, identity reinforcement → monopolistic allocation. Later: abuse foreclosed positive mechanism (reinforcement became punishment) → anti-cult community offered substitute nuclear package in opposite direction → mechanism substitution executed automatically through reinforcement of new high-intensity sources . Transition from positive to negative mechanism demonstrates process symmetry through identical reinforcement dynamics; subsequent stability of anti-cult identity demonstrates superior scalability of positive mechanism (helping others, community service) vs. maintaining pure hatred.

Parental Sacrifice for Vegetative Child
Observed phenomenon: Parent devotes entire life to vegetative child despite no reciprocation.

RTT explanation: Child receiver holds nuclear weight → care-giving mechanism still delivers trace intensity (parent experiences profound valuation of child's existence and wellbeing) → sustains allocation through continued reinforcement despite lack of behavioral feedback from child. Positive mechanism scales efficiently (parent can maintain allocation without constant external validation) and synergizes with broader identity as "devoted parent" which receives social reinforcement.

Honor Killing
Observed phenomenon: Father kills daughter for sexual transgression, destroying his own life.

RTT explanation: Community-honor mechanism nuclear → transgression threatened –nuclear collapse (loss of all community-based trace reinforcement) → killing restores community traces at lower total cost through reestablishment of reinforcement sources (community approval, honor restoration). Negative coercive mechanism persists only because cultural structure sustains it through continued reinforcement; requires constant enforcement and collapses when positive alternatives (forgiveness, rehabilitation) become accessible and can be sampled. This explains why honor killings decline with modernization—positive mechanisms outcompete negative coercive systems when constraints are removed and alternatives can be directly experienced.

Recovering Addict to Addiction Counseling Pipeline
Observed phenomenon: Recovered addicts disproportionately become counselors with intense commitment.

RTT explanation: Recovery foreclosed drug mechanism (no more chemical reinforcement) → counseling offers substitute nuclear package through different reinforcement sources → mechanism substitution. Positive mechanism (helping others, community belonging, clear identity, purpose) offers superior scalability compared to addiction (negative self-trace, social isolation, diminishing returns from substance) through sustainable reinforcement sources. This explains high stability of recovery-to-counseling path—positive mechanism delivers superior trace-delivery given constraint structure, providing consistent reinforcement without depletion.

Martyrdom
Observed phenomenon: Individual willingly accepts certain death for cause with serenity/ exaltation.

RTT explanation: Martyrdom mechanism offers infinite-duration nuclear/posthumous trace package (anticipated eternal honor, divine reward, community reverence) → dominates all living alternatives in expected total reinforcement → full monopolistic allocation executed. Positive mechanism (eternal honor, divine reward, in-group elevation) scales infinitely in duration, outcompeting finite living mechanisms through unlimited anticipated reinforcement stream.

Speculative Point: Martyrdom rates arewe highest where cultural mechanism is most elaborated and credible, enabling strongest anticipated reinforcement. Martyrdom is more stable when framed as positive (eternal reward) than negative (revenge/punishment), explaining why religious martyrdom (positive: heavenly paradise, divine approval, eternal honor) is more common and culturally sustained than purely vengeful suicide terrorism (negative: harm to out-group). Positive martyrdom mechanisms self-reinforce through community celebration and narrative; negative mechanisms require constant cultural reinforcement and often collapse without external support structures.

Process Symmetry (Identical for Positive and Negative):

- Evaluation through direct reinforcement: organism experiences trace intensity and automatically reorganizes
- Behavioral signatures: escalation, foreclosure, protective cascades, sign inversion
- Physiological responses: intrusive preoccupation, arousal, motivational stress
- Optimization logic: maximize |distance| from zero on signed scalar continuum through reinforcement learning
- Mechanism-switching dynamics: sampling → reinforcement → automatic adoption

Why Positive Mechanisms Are Superior Given Constraint Structure

Scalability:

- Positive: One person can generate positive traces in many receivers simultaneously (teacher, leader, parent with multiple children) without capacity scaling linearly

- Negative: Coercion typically requires dedicated attention per target; doesn't scale efficiently due to monitoring requirements

Self-Reinforcement:

- Positive: Cooperation begets cooperation through reciprocal reinforcement; trust generates reciprocal trust; positive traces amplify through social networks creating reinforcement cascades

- Negative: Coercion generates resistance; hatred often breeds counter-hatred; negative traces create instability and undermine reinforcement sources

Maintenance Cost:

- Positive: Once established, positive mechanisms often self-sustain through mutual reinforcement (friendships, communities, shared identities)

- Negative: Require constant monitoring, enforcement, threat maintenance; defection is continuous risk; reinforcement requires continuous investment

Longevity:

- Positive: Can sustain indefinitely or even posthumously (legacy, reputation, continued influence) through continued social reinforcement
- Negative: Typically exhaust over time as costs accumulate or targets are eliminated/ escaped, terminating reinforcement sources

Synergy Potential:

- Positive: Multiple positive mechanisms amplify each other through mutual reinforcement (family + community + career + ideology)

- Negative: Multiple negative mechanisms often compete for capacity and create contradictions, interfering with each other's reinforcement

Portfolio Stability:

- Positive: Provide redundancy—loss of one mechanism can be substituted by others maintaining reinforcement flow

• Negative: Often concentrated on single target—foreclosure risk is extreme when that reinforcement source is lost

When Negative Mechanisms Persist

Despite their inferiority given constraint structure, negative mechanisms persist under specific Conditions:

Foreclosure of Positive Alternatives:

• Honor cultures where reconciliation = dishonor, eliminating positive reinforcement pathways
• Abusive relationships with high exit barriers preventing access to alternative reinforcement sources
• Political situations where cooperation is impossible
• Vendetta systems where forgiveness would collapse social standing and all community reinforcement

Short-Term Magnitude Superiority:

• Revenge may offer immediate high-magnitude negative trace reinforcement
• Coercion may deliver faster results than cooperation in specific contexts
• Hatred may feel more intense than available positive alternatives in the moment

Cultural Infrastructure Support:

• Honor-killing systems maintain negative mechanisms through collective enforcement and continued cultural reinforcement
• Terrorist organizations provide structure for sustained hatred through ideological reinforcement
• Vendetta cultures ritualize and sustain negative traces across generations through narrative and social reinforcement

Sunk-Cost Lock-In:

• Portfolio already monopolized by negative mechanism
• Switching cost prohibitive given remaining capacity
• No accessible positive mechanism offers equivalent magnitude for sampling

Sign Inversion Failures:

• Blocked positive mechanism cannot successfully invert to positive alternative due to access barriers
• Only available inversion is to negative when positive substitutes are unavailable
• Person lacks capacity or access to discover and sample superior positive substitutes

Evolutionary Implications

Selection favored positive-mechanism discoverers. Individuals who identified cooperative, scalable, positive trace-generation infrastructures through sampling outcompeted those who relied on coercion, dominance, and negative mechanisms. Positive mechanisms provided more reliable, sustainable fitness benefits through self-reinforcing cooperation.

Although RTT predicts positive social infrastructures dominate due to their self-reinforcing nature, the optimizer remains sign-neutral because:

- Environmental and trace-delivery mechanism variability requires behavioral flexibility
- Foreclosure scenarios occur where negative revaluation of trace is only option to maintain trace intensity (especially in high magnitude traces)
- Sign inversion must be available as emergency strategy through reinforcement flexibility
- Complete positive-bias would create vulnerability in certain contexts
- Aversion is the signed opposite of Attraction on the signed continuum

Result: Modern humans possess a sign-neutral optimizer operating through reinforcement learning that systematically discovers positive mechanisms are superior—not because of moral preference, but because of performance characteristics given the constraint structure of physical and social reality.

Implications for Intervention

<u>Standard Approach:</u>

- Try to eliminate negative mechanisms through punishment, shaming, or argument
- Assume people will automatically choose positive alternatives once negative is removed
- Focus on reducing hatred, violence, extremism directly through narrative intervention

<u>RTT-Informed Approach:</u>

- Positive mechanisms must be actively provided for direct sampling, not assumed
- Removing negative mechanism without superior positive substitute creates vacuum
- Must offer positive alternative that delivers equal or greater magnitude through direct experience
- Accessibility enabling direct sampling and synergy with existing portfolio are critical

Examples:

De-radicalization:
• Ineffective: Argue against ideology, imprison, isolate (narrative-only intervention)
• Effective: Provide superior positive mechanisms (community, purpose, identity, belonging) that deliver equivalent nuclear intensity through direct sampling and sustained reinforcement

Addiction Recovery:
• Ineffective: Remove substance access alone
• Effective: Recovery → counseling pipeline provides superior positive mechanism substitution through alternative reinforcement sources (helping others, community, purpose, identity)

Domestic Abuse Intervention:
• Ineffective: Remove abuser without support system
• Effective: Build positive alternatives (economic independence, social support, new identity mechanisms) before or during exit, enabling sampling of superior reinforcement sources

Cult Exit:
• Ineffective: Deprogramming through argument alone
• Effective: Anti-cult activism provides substitute nuclear package maintaining intensity through alternative positive reinforcement (helping others, community, clear purpose)

Subjective Valuation and Behavioral Reality

The only objective fact is behavior. All else—emotions, beliefs, intentions, valuations, narratives—are subjective and unobservable. Each person exists in a unique, subjectively-constituted reality where valuation is primary and irreducible. There is no "mechanism quality" independent of the receiver experiencing its reward trace.

Why This Matters

RTT Does Not Claim:
• Features that make mechanisms universally valuable
• People can be wrong about their valuations
• External observers can judge "correct" vs "incorrect" optimization
• All humans should value the same mechanisms similarly

RTT Claims:

- The optimizer works within each person's subjective reality
- "Superior mechanism" means subjectively experienced as generating higher trace intensity
- Behavioral allocation reveals the person's unique valuation structure through revealed preference
- There is no external standpoint from which to judge optimization quality

Implications

Why the Same Information Produces Opposite Responses:

Exposure to identical information can produce divergent behavioral outcomes because valuation is receiver-dependent rather than mechanism-intrinsic. When one individual converts to Christianity while another becomes an atheist following the same exposure, the difference does not reflect variation in information quality or correctness. Instead, each individual samples and adopts the mechanism that generates higher reward-trace intensity within their uniquely constituted subjective reality. In both cases, behavioral allocation reflects successful optimization through reinforcement learning operating within the individual's valuation frame.

Why "Irrational" Behavior Is Actually Rational:

Behaviors commonly labeled irrational by external observers often reflect coherent optimization within a different subjective reality. Practices such as honor killing appear nonsensical or pathological when evaluated through an external valuation structure. However, within the actor's subjectively constituted reality, the community-honor mechanism may generate extremely high valuation through experienced reward-trace intensity. Behavioral optimization via reinforcement learning is therefore functioning effectively within that frame. The observer's valuation system is constituted differently, and no external standpoint exists from which to designate one optimization process as correct and the other as incorrect.

Why Argument Rarely Changes Nuclear Commitments:

Argument rarely alters deeply entrenched commitments because it attempts to impose an external valuation structure through narrative rather than modifying the underlying reward landscape. An individual's behavioral allocation reveals true valuations through direct experience, not through articulated beliefs. Narratives primarily function as post-hoc rationalizations of behavior and are largely causally inert with respect to valuation change. Durable shifts in commitment occur only when an individual is exposed to a mechanism that can be directly sampled and experienced as producing higher reward-trace intensity within their subjective frame, rather than through logical persuasion alone.

What Can Be Tested

Although Reward Trace Theory treats valuation as irreducibly subjective, it nevertheless generates empirically testable predictions about the structure and dynamics of behavior. These predictions concern not the content of individual preferences, but the process by which behavioral allocation unfolds under reinforcement and constraint.

Behavioral portfolios are predicted to exhibit internal consistency with optimization under reinforcement learning given revealed preferences. Allocation behavior should reflect trade-offs imposed by finite attentional, temporal, and energetic capacity, with shifts in engagement occurring when mechanisms are blocked or degraded. Substitution dynamics are therefore expected: when access to a high-intensity mechanism is constrained, individuals will reallocate capacity toward alternative mechanisms capable of preserving reward-trace intensity.

Across individuals and cultures, RTT predicts the emergence of structural universals that arise from shared constraint architecture rather than shared values. Behavioral portfolios should exhibit nuclear concentration, in which a small number of mechanisms monopolize the majority of available capacity through strong reinforcement. Under perceived threat to these reinforcement sources, protective cascades are expected, characterized by escalation and defensive behavior aimed at preserving access to high-intensity traces. The reinforcement process itself is predicted to be sign-symmetric, producing identical behavioral dynamics regardless of whether valuation is positive or negative. Mechanism adoption should follow a consistent trajectory of sampling, reinforcement, and eventual automaticity once sufficient trace intensity is established.

RTT also makes distributional predictions about the prevalence and organization of mechanisms across environments. Positive mechanisms are expected to dominate stable behavioral portfolios because they are more scalable and sustainable under finite-capacity constraints. Negative mechanisms should cluster under foreclosure conditions, where access to positive reinforcement pathways is restricted, rather than emerging as preferred equilibria. When sign inversion occurs, the total magnitude of valuation is predicted to be conserved, with reinforcement dynamics reallocating intensity across mechanisms rather than eliminating it altogether.

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