

# The Physics of Lasting Love

## A Descriptive Theory of Marriage as a Viability System

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### Introduction: From Prescription to Description

Most advice about marriage is prescriptive: *communicate better, show appreciation, don't go to bed angry*. These recommendations come from a good place—often backed by empirical research showing that couples who do X stay together longer than couples who don't. But prescription carries a hidden burden. It moralizes. It implies that if your marriage fails, you didn't try hard enough, didn't follow the rules, didn't *want* it enough.

This essay takes a different approach. Instead of asking "what should couples do?", it asks: **what must be structurally true for a marriage to persist and flourish?**

The framing comes from Evolution by Emergence (EbE), a theoretical framework that studies how complex systems maintain themselves over time. From molecules to ecosystems to societies, persistent systems share certain structural features—not because they *should* have them, but because systems lacking these features don't persist. They collapse, dissolve, or transform into something else.

A marriage is such a system: two living minds, coupled together, embedded in a larger social network, trying to continue existing as a unit while both individuals also continue existing as themselves. If we ask what structural constraints such a system must satisfy to persist, we get something that looks like advice—but isn't. It's closer to physics. These are the conditions under which the thing called "lasting marriage" can exist at all.

The difference matters. "You should communicate" is a moral injunction you can fail at and feel guilty about. "Persistent marriages have functioning feedback loops" is a description of reality. One invites shame; the other invites engineering.

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### Part I: The System

#### What Is a Marriage, Structurally?

In EbE terms, a marriage is:

- **Two autonomous agents** (living minds with their own perceptions, needs, goals, and growth trajectories)
- **A relational pattern** between them (the coupling, the "us")

- **Emergent structures** that exist only at the level of the relationship (shared culture, traditions, projects)
- **Embedded in larger networks** (families, work, culture, economy, technology)

A "long and happy marriage" is then: *a pattern that keeps re-emerging and stabilizing in the face of shocks, while both agents experience net positive viability.*

This framing immediately reveals something important: the marriage must maintain viability at **two levels simultaneously**—the health of each individual partner AND the health of the relational bond. These are not the same thing, and sacrificing one for the other creates structural fragility.

A marriage where one partner's identity has been absorbed into the relationship may be stable in the short term, but it has lost one of its two agents. What remains isn't two living minds in viable partnership; it's one agent plus one depleted substrate. Similarly, a marriage where both individuals thrive but the relational bond has withered isn't really a marriage anymore—it's two people cohabiting.

## The Viability Function

We can express this formally. Each partner  $i$  has a viability function:

$$V_i = f(A_i, C_{ij})$$

Where:

- $A_i$  = autonomy (self-regulation capacity, internal coherence, ability to make choices)
- $C_{ij}$  = coupling quality (reliability, reciprocity, repair capacity of the relationship)

The critical insight: **these dimensions are non-substitutable**. Viability approaches zero if either autonomy OR coupling falls below threshold. You cannot compensate for collapsed autonomy with more interdependence ("I've lost myself but at least we're close"). You cannot compensate for frayed connection with strong self-regulation ("I'm fine on my own, we just don't connect anymore").

Both must be maintained above minimum floors. Both. Simultaneously. Always.

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## Part II: The Seven Structural Constraints

What follows are not recommendations. They are descriptions of what must be true for a marriage to persist as a flourishing system. If these features are absent, the system either isn't persisting, isn't flourishing, or both.

### Constraint 1: Conservation of Two Agents

**The system must preserve two functioning, autonomous individuals.**

If one person effectively disappears—no preferences, no growth, no dissent, no independent inner life—the marriage may remain legally intact, but the underlying pattern is no longer "two living minds in viable partnership."

In persistent, flourishing marriages you observe:

**Preserved boundaries.** Each partner maintains their own tastes, friendships, projects, and domains of competence. "We" decisions don't erase "I" identities; they emerge from negotiation between them.

**Bidirectional influence.** Both partners can update the other's behavior, beliefs, and habits. Over years, you see traces of each in the other—but neither has been overwritten.

**The right to say no.** There are domains where refusal is real and respected: time, body, money, social commitments. That "no" gets integrated into planning, not punished.

This isn't about protecting individual selfishness. It's structural: if one agent collapses, the system loses half its adaptive capacity. The marriage becomes brittle, running on one person's perception of reality, one person's problem-solving repertoire, one person's energy. That's a single point of failure.

## **Constraint 2: Functioning Feedback Loops**

**The system must have learning mechanisms that actually update behavior.**

Every interaction generates signal: approval, irritation, boredom, delight, hurt, gratitude. In a persistent marriage, these signals don't just vent into the void—they change future policy.

What you observe:

**Conflicts that iterate, not circle.** After recurring fights, new rules emerge: "We don't discuss money when tired." "When I shut down, you give me twenty minutes before re-engaging." These rules stick. The same fight doesn't repeat identically forever.

**Explicit positive reinforcement.** "I really appreciated you handling that." "It meant a lot that you remembered." This isn't politeness—it's the system marking which behaviors to repeat.

**Micro-updates over time.** The way the couple talks, plans, divides labor, handles stress—it visibly shifts as new information arrives (illness, children, job changes, aging parents). You can see gradient descent happening: each year, the system is slightly better tuned to their actual environment.

Without feedback loops that actually modify behavior, you get either frozen dynamics (nothing ever changes, resentments calcify) or runaway dynamics (conflicts escalate without learning). Persistent marriages live in the middle: stable, but plastic.

## **Constraint 3: The Ratchet Mechanism**

**The system must have corrective actions with memory that lock in gains.**

The "safe set" is the zone where both partners feel secure, valued, connected, and capable. Disturbances—stress, conflict, external shocks, illness, betrayal—constantly try to push the system out of this zone.

What keeps the marriage viable isn't avoiding disturbance (impossible) but having **ratchets**: mechanisms that restore the system to safety AND encode what was learned so the same failure mode doesn't repeat.

A fight is a disturbance. Making up is restoration. But the ratchet only clicks forward if the reconciliation includes a **changed pattern**: "When I feel X, I'll say Y instead of Z." "When you need space, you'll tell me directly instead of withdrawing."

What you observe in persistent marriages:

**History as a library of solutions.** Long-married couples have accumulated a repertoire: "Remember when we dealt with something similar? We handled it by..." Their past is a resource, not just a record.

**Rising floors.** The minimum level of trust, understanding, and coordination tends to increase over time. Each survived crisis leaves behind better infrastructure for the next one.

**Non-repetitive conflict.** The presenting issues may recur (money, sex, in-laws, chores), but the *way* they're handled evolves. Couples who fight the same way about the same things decade after decade have a broken ratchet.

#### **Constraint 4: Emergent Assembly—"Third Things"**

**The system must generate structures that exist at the level of the relationship itself.**

This is crucial and often overlooked. A marriage is not just two people cohabiting. It's an assembly that creates emergent properties—things that exist only because the relationship exists, irreducible to either individual.

These "third things" include:

- Inside jokes that aren't funny to anyone else
- Shared rituals (Sunday morning routine, annual trips, how holidays work)
- Co-created home culture (what music plays, how meals happen, the feel of the space)
- Joint projects (raising children, building a business, renovating a house)
- A shared narrative ("our story," how we met, what we've been through)
- Distributed memory (one remembers faces, one remembers dates, together they remember everything)

Why do third things matter structurally?

**They carry the bond through low-affect periods.** Emotional connection fluctuates—stress, fatigue, distraction, conflict all dampen it. When raw affection is low, third things maintain the relationship. You go

through the ritual, you reference the joke, you work on the project—and the bond persists even when the feeling isn't actively present.

**They provide rails back to intimacy.** "We always hug before sleep, even if we're annoyed." That's a structural ratchet. You don't need to generate goodwill from scratch; you walk along established rails.

**They're load-bearing.** The more third things exist, the more pathways the relationship has for self-maintenance. This is redundancy—the k-cover principle applied to intimacy.

Couples without third things are always running on raw affect. That's fragile. Third things are the infrastructure of love.

### **Constraint 5: Substrate Identification and Maintenance**

**The system must recognize and actively maintain its critical substrates.**

"Substrate" in EbE means the foundational resources that a system depends on. Drop below the floor in any critical substrate, and the system fails—no matter how strong other dimensions are.

For marriages, the critical substrates include:

**Trust and psychological safety.** The foundation for vulnerability, honesty, and conflict resolution. Without it, information stops flowing, feedback loops break, and both partners start managing impressions instead of sharing reality.

**Respect and recognition.** Each partner's inner world must be treated as real and legitimate. "I don't see it that way, but your experience is valid" is the minimum. Contempt—treating the partner as beneath consideration—is substrate collapse.

**Fairness and reciprocity.** The system must avoid parasitic extraction where one partner consistently benefits at the other's expense. Persistent imbalance generates resentment, which corrodes everything else.

**Intimacy—physical and emotional.** The pair-bond has biological and psychological substrates that require maintenance. Neglect here doesn't immediately kill the marriage, but it drains the reservoir that buffers against stress.

**Shared meaning.** The couple needs some answer to "why us?"—shared values, goals, direction, or at minimum a story that makes the partnership feel coherent rather than accidental.

What you observe in persistent marriages:

**Calibrated alarms.** Both partners have learned to detect drops in these substrates early—before crisis. "Something feels off" gets attention, not dismissal.

**Maintenance rituals.** Date nights for intimacy, check-ins for safety, appreciations for respect, financial meetings for fairness. These aren't romantic extras; they're substrate maintenance.

**Floor-protecting norms.** "We don't call names." "We don't threaten divorce in fights." "We don't make major decisions when exhausted." These rules exist because the couple has learned where their floors are.

### **Constraint 6: Capture Resistance**

**The system must resist being dominated by any single perspective or external force.**

"Capture" means one element gaining disproportionate control over the whole system. In marriages, capture threats include:

- One partner's reality becoming the only valid reality
- One partner's needs consistently overriding the other's
- External systems (work, addiction, ideology, family of origin) absorbing the couple's energy and attention
- A single narrative about the relationship that neither partner can question

Capture is dangerous because it destroys the heterogeneity that makes the system intelligent. Two perspectives, integrating information from different vantage points, are more robust than one. Collapse that to a single viewpoint and you've lost half your sensors.

What you observe in capture-resistant marriages:

**"You can't be crazy alone."** If one partner perceives a threat to any substrate ("I feel disconnected," "I don't feel respected"), it gets treated as real system input—even if the other partner doesn't see it that way. Dismissing your partner's perception ("you're overreacting") is a capture move, and healthy systems resist it.

**Both inner worlds remain legitimate.** "I" statements ("I feel...") are the norm. Both partners' experiences are treated as valid data, even when they conflict.

**External inputs, filtered together.** The couple draws on outside perspectives (friends, therapists, books, family) but processes them through their shared pattern. They don't simply import someone else's model of marriage.

**No single story dominates.** The relationship's history can be told multiple ways. "That was a hard year" and "that was when we grew the most" can coexist.

Capture resistance doesn't mean low influence—it means **no single influence owns the system unopposed**, including either partner.

### **Constraint 7: Extended Planning Horizon**

**The system must operate with a long-term orientation for core decisions.**

This may be the single most important structural feature. When the planning horizon is short ("if this doesn't improve soon, I'm out"), zero-sum thinking dominates. Winning today's argument feels more important than preserving tomorrow's trust. Short-term comfort beats long-term investment.

With a "forever" horizon—or at least "decades"—the calculus inverts:

**Winning at your partner's expense becomes irrational.** If you're playing an infinite game, damaging your co-player damages the game itself. Humiliating your partner to win an argument is a catastrophic long-term investment.

**Generosity becomes rational.** Small sacrifices for your partner's wellbeing are investments in the system's future capacity. They compound.

**Forgiveness becomes practical.** Holding grudges means carrying toxicity indefinitely. In an infinite game, you will need the same grace you're being asked to extend. Forgiveness isn't sainthood—it's game theory.

**Investment beats extraction.** Every hour spent on the relationship is an investment with decades to compound. Every selfish extraction is a withdrawal from a shared account you both need.

What you observe:

**"We" framing of problems.** "We have a problem" rather than "you are the problem." The issue is something the team faces, not something one partner is doing to the other.

**Mutual overpayment.** Both partners regularly put in more than "their share" without keeping score. This looks irrational in the short term; it's profoundly rational across decades.

**Trajectory over state.** The question isn't "are we happy right now?" but "are we heading somewhere good?" A hard year on a good trajectory beats a comfortable year on a declining one.

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## Part III: The Dynamics

### How It Fails: Stress Cascades

The seven constraints are not independent. They form a system, and systems can cascade. Understanding the failure modes reveals why maintaining all constraints matters.

Under stress, two collapses threaten:

**Autonomy collapse.** Stress degrades self-regulation capacity. The "checking loop" that evaluates information before acting weakens. Decisions become reactive. The internal model gets contaminated with poorly-validated updates—what EbE calls "mud formation." The person becomes less coherent, less predictable, less capable of good judgment.

**Coupling collapse.** Fear-driven behaviors—withdrawal, aggression, deception, blame—sever reliable connection. Signals to the partner become unreliable. Trust erodes. The feedback loop breaks.

Here's the cascade: autonomy collapse makes you an unreliable partner, which degrades your spouse's coupling quality. Coupling collapse removes the external stabilization you might have drawn on, which further degrades your autonomy. The spiral tightens.

This is why stress management isn't optional self-care. It's structural maintenance. Unmanaged stress threatens both constraints simultaneously.

## The Reciprocal Rescue

But the same structure that enables cascading failure enables cascading rescue:

When one partner's **autonomy** falters, **interdependence** provides scaffolding. The other partner can offer co-regulation, reality checks, practical help, emotional containment. "I've got you while you recover."

When one partner's **connections** fray—they've withdrawn, they're distant, they've messed up—their maintained **autonomy** gives them a stable base from which to repair. They can self-soothe enough to reach out. They can think clearly enough to apologize well.

This reciprocal rescue is the marriage's safety net. But it only works if **both axes are maintained prophylactically**. You cannot draw on reserves you haven't built.

This generates an ethical insight (still descriptive): *Maintain your autonomy not only for yourself but as a resource your partner may need. Maintain your coupling not only for connection but as insurance against your own future deficits.*

## Naming Fear: Meta-Awareness as Intervention

One mechanism deserves special attention: **naming fear converts it from a driver into data.**

When a partner can recognize "I am in a stress state"—and say so—several things become possible:

**Internal protection.** Awareness allows gating: "I shouldn't make decisions right now." "I should raise my threshold for believing negative interpretations." This preserves autonomy during threat.

**External signaling.** "I'm overwhelmed and might say things I don't mean" is information the other partner can use. It maintains coupling by explaining the turbulence rather than letting it damage trust.

**Rescue request.** "I need help with this" activates the interdependence structure. It draws on the relationship's resources appropriately.

This meta-awareness is itself a manifestation of autonomous interdependence: autonomy includes knowing your own limitations; interdependence includes willingness to both offer and request support.

## The Transition Trajectory

Most relationships don't start in perfect autonomous interdependence. They start somewhere in codependent space—neither partner fully autonomous, trauma patterns present, feedback loops partially broken.

The question isn't whether you start healthy. It's whether the **trajectory** points toward health.

The transition typically moves through phases:

**Phase 1: Awareness without change.** Both partners start noticing patterns. "We do this thing where..." "I notice that when you do X, I do Y." No fixing yet—just seeing.

**Phase 2: Messy experimentation.** Attempts at new patterns. These feel worse before they feel better. The previously-accommodating partner tries boundaries and feels guilt. The previously-controlling partner releases control and feels anxiety. Many failures. Many repairs.

**Phase 3: New patterns with regression.** Moments of genuine autonomous interdependence emerge. But stress triggers old patterns. The difference: recovery is faster. The couple knows how to get back.

**Phase 4: Stable new normal.** Autonomous interdependence becomes the default. Old patterns still occasionally surface, but they're recognized quickly and don't spiral.

The structural requirement isn't perfection—it's that the system is **ratcheting forward** rather than stuck or sliding back.

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## Part IV: What This Explains

### Why Gottman's Findings Work

John Gottman's empirical research has produced robust predictors of divorce and stability. The EbE framework explains *why* they work:

**The Four Horsemen** (criticism, contempt, defensiveness, stonewalling) are substrate violations. Contempt attacks the respect substrate directly. Stonewalling breaks the feedback loop. Criticism (of character rather than behavior) degrades psychological safety. Defensiveness blocks information flow.

**The 5:1 ratio** (five positive interactions per negative one) describes safe-set dynamics. Negative interactions push the system toward viability boundaries. Positive ones restore margin. The ratio maintains the system within its viable region.

**Repair attempts** are exactly what EbE calls "corrective actions with memory." Their success rate predicts marriage longevity because repair IS the ratchet mechanism.

"**Turning toward**" bids for connection maintains the coupling substrate. Each bid is a micro-test of the feedback loop. Turning toward reinforces it. Turning away lets it atrophy.

### Why Attachment Patterns Matter

Attachment theory describes how early relationships shape expectations about safety and responsiveness. In

EbE terms, attachment patterns are **prior distributions** over substrate reliability:

- Secure attachment = baseline expectation that coupling substrates will be maintained
- Anxious attachment = uncertainty about substrate reliability, driving monitoring and protest
- Avoidant attachment = expectation of substrate failure, driving preemptive withdrawal

The EbE framework doesn't replace attachment theory—it contextualizes it. Attachment patterns are one factor shaping how agents estimate their viability function, which substrates they monitor most vigilantly, and what their floor tolerances are.

### **Why "Working On the Relationship" Works (When It Does)**

Generic advice to "work on your relationship" often fails because it doesn't specify what to work on. The EbE framework provides targeting:

- Which substrate is below floor?
- Which constraint is violated?
- Is the ratchet stuck (same fights repeating)?
- Is there capture (one perspective dominating)?
- Are third things eroding?
- Has the planning horizon collapsed?

Intervention without diagnosis is noise. The structural constraints provide diagnostic categories.

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## **Part V: The Signature**

If you observed a persistent, flourishing marriage over years—coding it like network data rather than asking how it feels—you would see this signature:

1. **Two distinct agents** with stable personal identities, both visibly updating and influencing each other over time.
2. **Functioning feedback loops** where conflicts produce new rules, positive experiences get reinforced, and patterns visibly evolve with circumstances.
3. **A ratcheted history** of overcome challenges. Each major stress produced a new, durable solution. The system's conflict capacity has grown.

4. **Rich emergent structure**—inside jokes, rituals, shared spaces, joint projects, distributed memory, a "home culture" that belongs to neither individual alone.
5. **Maintained substrates** with calibrated alarms. Both partners monitor trust, respect, fairness, intimacy, and meaning. Drops get detected early.
6. **Capture resistance.** No single story, perspective, or external system dominates. Both inner worlds remain legitimate. External input gets filtered through shared values.
7. **Long-horizon operation.** Daily choices reflect assumption of continued co-existence. Generosity is rational. Forgiveness is practical. Investment beats extraction.

And from the inside—what does it feel like?

The EbE framework suggests: **love, in a persistent marriage, is less an emotion that comes and goes than an ongoing orientation.** It is the motivated, attentive monitoring of and investment in your partner's substrates—because your flourishing is structurally entangled with theirs.

"Making you happy makes me happy" isn't a romantic platitude. It's a description of how viability functions couple.

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## Conclusion: The Physics of Persistence

This essay has not told you what to do. It has described what must be true for a marriage to persist and flourish—the structural constraints that any such system satisfies, whether the couple knows the theory or not.

The constraints are demanding. Maintain two autonomous agents. Keep feedback loops functioning. Build ratchets that lock in learning. Generate and maintain third things. Identify and protect substrates. Resist capture. Operate with long horizons. Manage stress to prevent cascades. Build reserves before you need them.

But notice: these aren't arbitrary rules imposed from outside. They're the conditions under which the phenomenon called "lasting marriage" can exist. Violate them and you might still have a legal marriage, a cohabitation, a co-parenting arrangement, an economic partnership—but not the thing we mean when we say "long and happy marriage."

This framing has a certain liberating quality. If your marriage is struggling, the question isn't "whose fault is it?" or "are we bad at love?" The question is: "which constraint is violated, and can we restore it?" That's an engineering problem, not a moral judgment.

And if it can't be restored—if one partner has collapsed into the other, if the feedback loops are permanently broken, if trust substrate has been depleted beyond recovery—then ending the marriage isn't failure. It's recognition that the structural conditions for this particular system's persistence no longer obtain. The system has already ended; the paperwork just catches up.

The physics doesn't judge. It just describes what persists, what flourishes, and what doesn't.

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## Appendix: The Formal Structure

For readers interested in the mathematical framing:

### Viability function:

$$V_i(t) = \left( \frac{A_i(t)}{A_{\min}} \right)^{\alpha_A} \cdot \prod_{j \in \mathcal{N}(i)} \left( \frac{C_{ij}(t)}{C_{\min}} \right)^{\alpha_{ij}}$$

This multiplicative form ensures  $V_i \rightarrow 0$  if either autonomy ( $A_i$ ) or any critical coupling ( $C_{ij}$ ) falls below threshold—capturing non-substitutability.

### Balance condition:

$$\frac{\partial V_i}{\partial A_i} \approx \frac{\partial V_i}{\partial C_{ij}}$$

Sustainable systems approach equilibrium where marginal investment in autonomy roughly equals marginal investment in coupling.

### Reciprocal coupling:

$$\frac{\partial V_i}{\partial C_{ij}} \geq 0 \quad \text{AND} \quad \frac{\partial V_j}{\partial C_{ij}} \geq 0$$

Coupling is reciprocal when it benefits both partners. Parasitic coupling ( $\partial V_i / \partial C_{ij} > 0$  but  $\partial V_j / \partial C_{ij} < 0$ ) is structurally unstable.

**Ratchet condition:** After perturbation  $\delta$  and recovery, the system satisfies:

$$z^{(k)}(t_{\text{after}}) \geq z^{(k)}(t_{\text{before}})$$

for at least some substrates  $k$ —the floor rises.

**k-Cover:** Each critical substrate is monitored by at least  $k$  independent sensors. For marriage with two partners,  $k = 2$  is maximum—making single-monitor failure (one partner stops attending) immediately dangerous.

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*This essay is part of the Evolution by Emergence project. For the full theoretical framework, see the EbE repository and ARVC papers.*