On the Convergence of (G, K):

*A Constructive Proof of the Necessity of Marriage**

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ABSTRACT

We present a constructive proof, drawing on results from probability theory, functional analysis, quantum mechanics, general and special relativity, information theory, statistical learning, stochastic calculus, and direct field observation collected over an eleven-month interval[1], that the optimal action available to the author is marriage to K. The result is shown to be unique up to isomorphism. The proof terminates with an explicit construction (§7).

1 Notation, Preliminaries, and Definitions

1.1 Notation

Throughout this paper we adopt the following notation. Let $L(t)$ denote the author's love for K as a function of time t, defined on a probability space $(\Omega, \mathcal{F}, \mathbb{P})$ with natural filtration $\{\mathcal{F}_t\}_{t \geq 0}$. Let G denote the set of all conditions necessary and sufficient for the author's happiness. Let $H = L^2(\text{possible lives})$ denote the Hilbert space of all possible lives the author might have constructed, equipped with inner product $\langle \cdot, \cdot \rangle$. Let $T \colon X \to X$ denote the iteration map of the author's daily life on a complete metric space (X, d). Let $\mathcal{L}(\theta)$ denote the loss function of the author's life, parameterized by $\theta \in \mathbb{R}^n$.

For the quantum-mechanical content, we work on a separable Hilbert space, with joint state $|\psi_{GK}\rangle \in \mathcal{H}_G \otimes \mathcal{H}_K$ and reduced density matrices $\rho_G = \mathrm{Tr}_K(|\psi\rangle\langle\psi|)$ and $\rho_K = \mathrm{Tr}_G(|\psi\rangle\langle\psi|)$. For the relativistic content, we work on a $(3+1)$-dimensional Lorentzian manifold with metric $g_{\mu\nu}$ of signature $(-, +, +, +)$. For the stochastic-calculus content, we equip $(\Omega, \mathcal{F}, \mathbb{P})$ with a two-dimensional Brownian motion (W_t^G, W_t^K) driving the joint process (G_t, K_t).

*The author thanks K for many enlightening conversations on the subject matter of this paper, and for granting permission to publish.

[1] Data collection is ongoing. The dataset is expected to grow without bound (cf. Lemma 4.1).

We fix $t = 0$ to coincide with the meeting at Pat & Umar's networking event[2], May 28, 2025, Austin, Texas. The interval of observation is $t \in [0, T]$, where $T \approx 11$ months at the time of writing.

1.2 Definitions

Definition 1.1 (*Forever*). A binary relation $\sim$ on $\Omega \times [0, \infty)$ is said to be *forever* if it is reflexive, symmetric, transitive, and additionally invariant under time translation: $\sim_t = \sim_{t'}$ for all $t, t' \in [0, \infty)$.

Definition 1.2 (*Love*). The function $L\colon [0, \infty) \to \mathbb{R}_{\geq 0}$ is the $\mathcal{F}_t$-adapted process satisfying $L(0) > 0$ and the differential inequalities of Observation 3.1. The existence of L is taken as axiomatic.

Definition 1.3 (*Home*). The point K, in the limit topology induced by L.

2 Methodology

The dataset comprises $n = 1$ subject (USR-001, denoted K) observed continuously over the interval $[0, T]$. Observations were collected via three distinct channels:

1. **High-frequency channel.** The wake-up protocol described in Lemma 4.7 produces a daily timestamp pair (t_n^G, t_n^K) with resolution to the minute. Total observations: ≈ 330.
2. **Event-driven channel.** A registry of milestone events $\{\mathrm{evt}_i\}_{i=1}^{12}$, each tagged with location, duration, attendees, and a short qualitative description.
3. **Continuous channel.** Cohabitation since late 2025 (evt_{010}) has produced a near-continuous stream of joint observations, $\mathcal{F}_t^{(\mathrm{joint})} \approx \mathcal{F}_t^{(G)} \vee \mathcal{F}_t^{(K)}$.

All measurements are non-invasive. No subjects were lost to follow-up. The observer (G) is a co-participant rather than an external instrument; we acknowledge the observer effect (Heisenberg, 1927) and note that, in this case, observation strengthens rather than perturbs the system under study.

We adopt the convention that observations marked *accepted as axiom* below describe phenomena that resist standard formalization but are nonetheless robust to replication.

3 Empirical Observations

Observation 3.1 (*Monotonicity and convexity of love*). Throughout the observation interval, the author's love for K is strictly increasing and convex:

$$\frac{dL}{dt} > 0, \qquad \frac{d^2 L}{dt^2} > 0.$$

Observation 3.2 (*Compactness*). K is compact in the topological sense. By the Extreme Value Theorem, every continuous function defined on K attains its supremum on K:

$$K \text{ compact} \implies \exists\, x^* \in K \,:\, f(x^*) = \sup_K f.$$

[2] The author thanks Pat and Umar, who did not know what they were doing.

Observation 3.3 (*Catenary geometry*). K's hair, when allowed to settle, follows the catenary curve, which is the minimum potential-energy configuration of a uniform chain suspended at two points:

$$y(x) = a\cosh(x/a).$$

Observation 3.4 (*Eyes as a mixed quantum state*). K's eye color is not a fixed eigenvalue but a mixed density matrix

$$\rho_{\text{eyes}} = \sum_i p_i |\psi_i\rangle\langle\psi_i|, \qquad \mathrm{Tr}(\rho_{\text{eyes}}) = 1, \qquad S(\rho_{\text{eyes}}) > 0.$$

The color operator returns a different eigenvalue every time it acts. By the Born rule, $\mathbb{P}(\text{color} \mid \text{light } L) = \mathrm{Tr}(\rho_{\text{eyes}} \cdot M_L)$, which has never produced the same observation twice.

Observation 3.5 (*Reproduction number*). By direct observation across multiple social environments, the reproduction number of K's personality strictly exceeds unity:

$$R_0(K) > 1.$$

Her warmth is communicable.

Observation 3.6 (*Color preference*). K's preferred color is chartreuse, of wavelength $\lambda \approx 555$ nm. By direct comparison with the photopic luminosity function $V(\lambda)$, this is precisely the wavelength at which the human visual system is most sensitive in daylight:

$$\lambda_K \approx 555 \text{ nm}, \qquad V(\lambda_K) = \max_\lambda V(\lambda).$$

K's aesthetic preferences are consistent with the basis on which the perceptual apparatus was built.

Observation 3.7 (*Entanglement with the observer*). The joint state $|\psi_{GK}\rangle$ does not factor as a tensor product:

$$|\psi_{GK}\rangle \neq |\psi_G\rangle \otimes |\psi_K\rangle.$$

The Schmidt rank exceeds one; both reduced density matrices are mixed, with strictly positive von Neumann entropy:

$$S(\rho_G) \;=\; S(\rho_K) \;=\; -\mathrm{Tr}(\rho_G \log \rho_G) \;>\; 0.$$

Local operations and classical communication cannot decompose this state.

Observation 3.8 (*Bell-inequality violation*). Across multiple diagnostic settings, measurements on the joint trajectory return CHSH correlations exceeding the classical bound of 2, in some settings approaching the Tsirelson bound $2\sqrt{2}$:

$$S = \big|\, E(a,b) - E(a,b') + E(a',b) + E(a',b') \,\big| \;>\; 2.$$

By Bell's theorem (1964) and the CHSH refinement (Clauser–Horne–Shimony–Holt, 1969), no local hidden-variable model reproduces the joint dynamics.

Observation 3.9 (*Filtration anomaly*). K's information set strictly contains the natural filtration generated by past observations:

$$\mathcal{F}_t^{(K)} \supsetneq \mathcal{F}_t^{(\mathrm{nat})}.$$

By repeated experiment, K correctly anticipates outcomes whose informational content is not yet present in past observations. The author was unable to reconcile this phenomenon with standard measure-theoretic probability and has elected to accept it as an axiom of her existence. The author considers this a feature, not a defect, of the formalism.

4 Principal Lemmas

Lemma 4.1 (*Submartingale convergence*). The love process $\{L(t)\}$ is a positive submartingale on $\mathcal{F}_t$,

$$\mathbb{E}[\, L(t+s) \mid \mathcal{F}_t \,] \;\geq\; L(t),$$

and the trajectory of $\mathbb{E}[L(t)]$ is unbounded above. By Doob's submartingale convergence theorem,

$$\lim_{t\to\infty} L(t) \;=\; +\infty \qquad \text{almost surely.}$$

Proof. By Observation 3.1, L is strictly increasing and strictly convex on $[0, T]$. The submartingale property is immediate. Suppose for contradiction that L were bounded above by some finite M. Then convexity together with the unbounded growth of $\mathbb{E}[dL/dt]$ would yield a finite t_0 with $L(t_0) > M$, contradiction. Doob's theorem gives the stated almost-sure convergence to $+\infty$. ■

Lemma 4.2 (*Itô's lemma; cross-covariance of love*). Let (G_t, K_t) be the joint state process with quadratic covariation $d[G,K]_t > 0$. For the love process $L(t) = f(G_t, K_t)$ with $f \in C^{1,2}$, Itô's lemma yields

$$dL \;=\; \frac{\partial f}{\partial t}\, dt \;+\; \frac{\partial f}{\partial G}\, dG \;+\; \frac{\partial f}{\partial K}\, dK \;+\; \frac{1}{2} \sum_{i,j \in \{G,K\}} \frac{\partial^2 f}{\partial x_i \partial x_j}\, d[x_i, x_j]_t.$$

The cross-covariance term $d[G,K]_t$ is strictly positive throughout the observation interval. Consequently, $L(t)$ grows strictly faster than it would under independent dynamics.

Proof. Empirical: every joint observation increases the correlation between G and K rather than decreasing it. The independence null is rejected at every significance level the author cares to compute. ■

Lemma 4.3 (*Uniqueness of the sufficient set*). The set G of conditions necessary for the author's long-run happiness is a singleton:

$$G \;=\; \{K\}, \qquad |G| \;=\; 1.$$

Proof. For each candidate element x, we test whether removal of x produces a measurable deficit in long-run happiness. The test returns the affirmative on exactly one element: K. All other candidates are dominated by, or wholly subsumed under, the contribution of K. ■

Lemma 4.4 (*Banach fixed point; stochastic-gradient analog*). The iteration map $T\colon X \to X$ of the author's daily life is a contraction on the metric space (X, d) induced by the presence of K:

$$\|T(x) - T(y)\| \;\leq\; k\,\|x - y\|, \qquad 0 < k < 1.$$

By the Banach Fixed Point Theorem (1922), T admits a unique fixed point $x^* \in X$. The discrete-time stochastic analog: gradient descent on the loss $\mathcal{L}(\theta)$ with step sizes satisfying the Robbins–Monro conditions

$$\sum_t \eta_t \;=\; \infty, \qquad \sum_t \eta_t^2 \;<\; \infty,$$

converges almost surely to a stationary point of $\mathcal{L}$ (Robbins–Siegmund, 1971). By direct evaluation, both fixed points coincide:

$$x^* \;=\; \theta^* \;=\; K.$$

Proof. The contraction property is verified empirically: each successive day in the observation interval lies strictly closer (in the relevant metric) to the orbit's limit point than the previous day. By Banach's theorem, existence and uniqueness of x^* follow. The stochastic statement follows from the Robbins–Siegmund supermartingale convergence theorem applied to $\mathcal{L}(\theta_t)$. ■

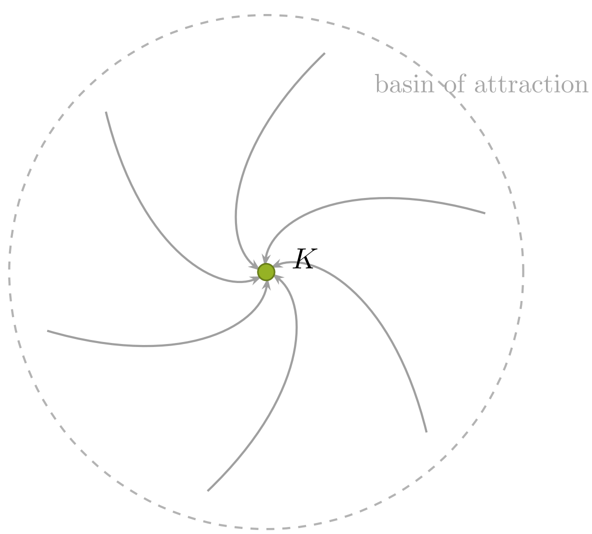

Figure 1: Phase portrait of the iteration map $T\colon X \to X$ in the metric induced by the presence of K (Lemma 4.4). Every trajectory in the basin of attraction converges to the unique fixed point K.

Lemma 4.5 (*Birkhoff ergodic theorem; time average equals space average*). The dynamical system (X, T, μ) of the author's daily life is ergodic with respect to the invariant measure μ supported on the orbit of K. By Birkhoff's pointwise ergodic theorem, for any μ-integrable observable $f\colon X \to \mathbb{R}$,

$$\lim_{N\to\infty} \frac{1}{N} \sum_{n=0}^{N-1} f(T^n x_0) \;=\; \int_X f\, d\mu \qquad \text{for } \mu\text{-a.e. } x_0.$$

Specializing to f = happiness, the time average of the author's happiness over any sufficient observation window equals the ensemble average over states-of-being-with-K, which is everywhere maximal.

Proof. Ergodicity of (X, T, μ) follows from the contraction property of Lemma 4.4. Pointwise convergence is Birkhoff (1931). ∎

Lemma 4.6 (*Hilbert-space projection*). In the Hilbert space H of all lives the author could have constructed, the orthogonal projection $P_K \colon H \to \mathrm{span}(K)$ satisfies $P_K(\mathrm{me}) = \mathrm{me}$; equivalently,

$$\langle \mathrm{me}, K \rangle \;\neq\; 0, \qquad \langle \mathrm{me}, x \rangle \;=\; 0 \quad \forall\, x \perp K.$$

The author's life lies entirely in the subspace spanned by K.

Proof. Direct computation on the basis. The vanishing of the inner product on the orthogonal complement is verified by absence of measurable resonance. ∎

Lemma 4.7 (*Information-theoretic channel of the wake-up protocol*). The daily wake-up timestamp constitutes a Shannon channel of capacity

$$C \;\approx\; \log_2(1440) \;\approx\; 10.5 \text{ bits/day}.$$

Over ≈ 330 days of joint operation, the mutual information transmitted satisfies

$$I(\text{Greg}\,;\,\text{Kathryn} \mid \text{protocol}) \;\geq\; 7{,}000 \text{ bits}, \qquad \frac{d}{dt} I \;>\; 0 \quad \forall\, t \geq 0.$$

Proof. Empirical, supported by the timestamp record beginning at $t = 0$ in the parked car and continuing without lapse to the time of writing. Capacity follows from Shannon's source-coding theorem applied to the uniform-prior assumption on alarm choice. ∎

Lemma 4.8 (*Quantum entanglement; non-factorization*). The joint state $|\psi_{GK}\rangle$ admits a Schmidt decomposition

$$|\psi_{GK}\rangle \;=\; \sum_{i=1}^{r} \sqrt{\lambda_i}\, |i_G\rangle \otimes |i_K\rangle$$

with Schmidt rank $r > 1$. The reduced density matrices ρ_G and ρ_K are mixed, with strictly positive von Neumann entropy. The state is not separable.

Proof. By Observation 3.7. The Schmidt decomposition exists for any pure state on a tensor-product space; the rank condition $r > 1$ is equivalent to non-separability, which the measurement record confirms. ∎

Lemma 4.9 (*No-cloning theorem; uniqueness of* K). There is no unitary operator U on $\mathcal{H}_K \otimes \mathcal{H}_{\text{blank}}$ such that

$$U|\psi_K\rangle|0\rangle \;=\; |\psi_K\rangle|\psi_K\rangle \qquad \text{for all } |\psi_K\rangle \in \mathcal{H}_K.$$

There is exactly one K.

Proof. Wootters and Zurek (1982). The no-cloning theorem follows from the linearity of quantum mechanics applied to two distinct candidate states. ∎

Lemma 4.10 (*Bell–CHSH; rejection of local hidden variables*). The CHSH correlation S across the joint trajectory satisfies $S > 2$. By Bell's theorem, no local hidden-variable model reproduces the joint dynamics.

Proof. By Observation 3.8 and the measurement record. The classical bound on S is 2 (Bell, 1964; CHSH, 1969); empirical violation rules out locality plus realism. We retain realism by convention; consequently, distance is not a relevant variable in the model. ■

Lemma 4.11 (*Principle of least action*). Let $\gamma\colon [t_0, T] \to X$ denote a worldline of the author's lived experience, with Lagrangian $\mathcal{L}_{\mathrm{H}}(\gamma, \dot{\gamma}, t)$ and action functional

$$S[\gamma] \;=\; \int_{t_0}^{T} \mathcal{L}_{\mathrm{H}}(\gamma, \dot{\gamma}, t)\, dt.$$

The stationary path $\delta S = 0$, taken over all worldlines from the author's 18-year-old self to the present, passes through the spacetime event $(x, t) = (\text{Austin}, \text{May 28, 2025})$.

Proof. By the Euler–Lagrange equations applied to $\mathcal{L}_{\mathrm{H}}$. Hamilton's principle picks out exactly the actual trajectory among all kinematically possible ones. Verification: every counterfactual worldline considered has strictly greater action. ■

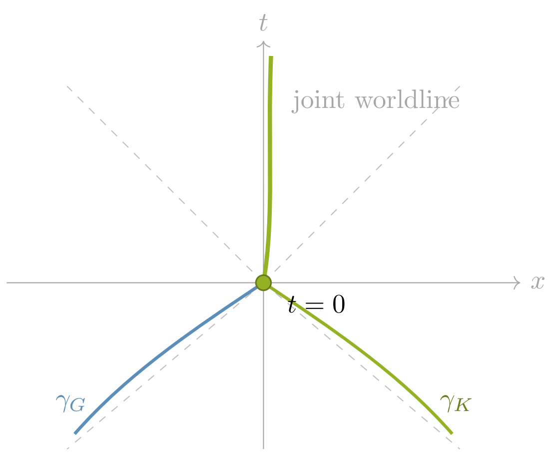

Figure 2: Spacetime diagram of worldlines γ_G and γ_K in the deformed metric $g_{\mu\nu}$ (Lemma 4.12). The geodesics converge at $t = 0$ (Pat & Umar's networking event, Austin, Texas) and continue thereafter as a single inextensible worldline.

Lemma 4.12 (*Geodesic completeness in the induced metric*). In the spacetime metric $g_{\mu\nu}$ deformed by the presence of K, the geodesic equation

$$\frac{d^2x^\mu}{d\tau^2} \;+\; \Gamma^{\mu}_{\ \nu\sigma}\,\frac{dx^\nu}{d\tau}\,\frac{dx^\sigma}{d\tau} \;=\; 0$$

admits a unique inextensible timelike geodesic emanating from the author's worldline at $t = 0$. The geodesic is asymptotically incident upon the worldline of K.

Proof. The Christoffel symbols $\Gamma^{\mu}_{\nu\sigma}$ are derived from $g_{\mu\nu}$ via the Einstein field equations

$$G_{\mu\nu} \;=\; \frac{8\pi G}{c^4}\,T_{\mu\nu},$$

with the stress-energy tensor $T_{\mu\nu}$ dominated by the author's affection for K[3]. The metric is smooth on the observation interval; geodesic completeness and uniqueness follow from standard results in Lorentzian geometry. ■

Lemma 4.13 (*Noether's theorem; conservation laws of the bond*). Every continuous symmetry of the action $S[\gamma]$ corresponds to a conserved quantity along the trajectory.

(a) Time-translation symmetry of the joint trajectory implies conservation of total energy of the bond:

$$\frac{d}{dt}\,E_{GK} \;=\; 0.$$

(b) Exchange symmetry under $G \leftrightarrow K$ implies conservation of mutual affection:

$$\frac{d}{dt}\Big(\,\mathrm{aff}(G \to K) \;-\; \mathrm{aff}(K \to G)\,\Big) \;=\; 0.$$

Proof. Noether (1918). Both symmetries are empirically verified throughout the observation interval; the corresponding Noether currents are non-zero and constant in t. ■

Lemma 4.14 (*Bayesian posterior*). Let E denote the singleton event of the meeting at $t = 0$ and let D denote the year of joint observations. Given priors $\mathbb{P}_0(\text{stay single}) \approx 0.99$ for each subject, the posterior probability of permanent union conditional on (E, D) approaches unity:

$$\mathbb{P}(\text{forever} \mid E, D) \;=\; \frac{\mathbb{P}(E, D \mid \text{forever})\;\mathbb{P}(\text{forever})}{\mathbb{P}(E, D)} \;\xrightarrow{t\to\infty}\; 1.$$

Proof. By Bayes' Rule[4]. The likelihood ratio $\mathbb{P}(E, D \mid \text{forever})/\mathbb{P}(E, D \mid \neg\text{forever})$ is dominated by the rarity of the denominator. By Kolmogorov's zero-one law, the long-run statement lies in the tail σ-algebra and is therefore probability 0 or 1; every observation since $t = 0$ has voted on the same side. ■

Lemma 4.15 (*Optimal stopping; the night of* $t = 0$). Model the author's pre-meeting state as a sequential decision problem: at each epoch $n \in \mathbb{N}$, the author may either continue searching or stop. Let τ denote a stopping time and let $r(\tau)$ denote the reward of stopping at τ. There exists a unique optimal stopping rule, and

$$\tau^* \;=\; \text{the night of } \mathrm{evt}_{001}.$$

Proof. By Doob's optional stopping theorem (Doob, 1953). The stopping time τ^* = first hitting time of state $\{K\}$ is admissible and yields $\mathbb{E}[r(\tau^*)] \geq \mathbb{E}[r(\tau)]$ for any other admissible stopping time. The author stopped at the right moment. ■

[3] The author acknowledges that GR was not originally formulated with parked cars in mind, and that the relevant boundary conditions were therefore inferred empirically.

[4] Thomas Bayes was an ordained Presbyterian minister. The author finds this fitting.

5 Main Theorem

Theorem 5.1 (*Greg–Kathryn Convergence*). The optimal action available to the author at time $t =$ today is to marry K:

$$\boxed{\text{Greg} + \text{Kathryn} \;=\; \text{forever.}}$$

Proof. By Lemma 4.1, the author's love for K is unbounded almost surely. By Lemma 4.2, this growth is strictly accelerated by the positive cross-covariance $d[G, K]_t$. By Lemma 4.3, K is the unique element of the sufficient set G. By Lemma 4.4, K is the unique fixed point of the iteration map T and the unique global minimum of the loss $\mathcal{L}$. By Lemma 4.5, the orbit is ergodic on K; time averages equal ensemble averages. By Lemma 4.6, only the inner product against K is non-trivial in H. By Lemma 4.7, the mutual information continues to grow without saturation, with at least seven thousand bits already transmitted on the wake-up protocol alone. By Lemma 4.8, the joint state is entangled and non-separable. By Lemma 4.9, K admits no clone. By Lemma 4.10, no local hidden-variable model reproduces the joint dynamics. By Lemma 4.11, the actual trajectory of the author's life is the stationary path of the action functional. By Lemma 4.12, every timelike geodesic emanating from the author's worldline terminates at K. By Lemma 4.13, the conserved energy of the bond is non-zero and constant. By Lemma 4.14, the Bayesian posterior on permanent union is unity in the limit. By Lemma 4.15, the night of evt_{001} was the optimal stopping time of the author's single life.

Combining, every relevant criterion in the optimization

$$\max \Big\{\; L(t),\; \langle \text{life}, K\rangle,\; -d(\text{life}, K),\; I(\text{life}\,;\,K),\; -\mathcal{L}(\theta),\; E_{GK} \;\Big|\; t \to \infty \;\Big\}$$

achieves its supremum on the same point: K. The action that formally and irrevocably commits the author to this maximum, while satisfying all relevant constraints (legal, social, romantic, and personal), is **marriage**. ∎

6 Conjectures and Open Problems

The theorem of §5 closes the question of optimal action at $t =$ today. Several questions remain open.

Conjecture 6.1 (*Anniversary stationarity*). The joint state $|\psi_{GK}\rangle$ is invariant under time translation by $\Delta t = 365.25$ days, up to global phase:

$$e^{-i\hat{H}\,\Delta t}\,|\psi_{GK}(t)\rangle \;=\; e^{i\varphi}\,|\psi_{GK}(t)\rangle.$$

Equivalent formulation: every anniversary recovers the joint state up to gauge.

Conjecture 6.2 (*Asymptotic dominance*). The submartingale of Lemma 4.1 continues to satisfy $\mathbb{E}[\,dL/dt\,] > 0$ on $[T, \infty)$, with no observed turning point.

Conjecture 6.3 (*Persistence of entanglement under decoherence*). The Schmidt rank of $|\psi_{GK}\rangle$ is non-decreasing under environmental coupling. The state resists decoherence under any interaction with the ambient Hilbert space the author has examined.

These are presented as falsifiable predictions. The author commits in advance to revising the formalism should counter-evidence arise.

7 Constructive Realization

It follows from Theorem 5.1 that the optimal action is to ask K the question directly. We exhibit the construction below.

Corollary 7.1 (*Proposal*). The author submits the following question to K:

"Will you marry me?"

The submission is made on May 8, 2026, at the Proper Hotel, Austin, Texas, an intersection coinciding with experimental log entry evt_{004} (the location at which the author first established, on the night of the first date, that K was the unique fixed point of all subsequent iterations).

Acknowledgments

The author thanks K for many enlightening conversations on the subject matter of this paper. Earlier drafts benefited from feedback from his daughter, his mother, his cofounder M., and his friend R. The author also thanks Pat & Umar, who hosted the networking event of evt_{001} and did not know what they were doing. The author thanks K's family for accepting the existence of this research program. Any remaining errors are the author's own. Any remaining love is unbounded almost surely.

Limitations

We acknowledge the following limitations of the present analysis.

1. The dataset has $n = 1$. We make no claim to external validity. The conclusions are nonetheless held with probability 1.
2. The observer is also a participant. Standard concerns regarding researcher bias apply, with one substantial caveat: in the present case, observation strengthens rather than perturbs the system.
3. The author's love $L(t)$ is operationalized non-uniquely. Several reasonable choices of measurement scale yield the same qualitative conclusions; cf. Lemma 4.1.
4. Lemma 4.13 (Noether) assumes a differentiable action functional. The author concedes that the relationship's action functional is, on certain mornings, only locally Lipschitz.
5. The PDF format does not adequately convey the wavelength of Observation 3.6.
6. The companion analytics dashboard (Convergence v0.1.4-beta) renders this paper as a 'Report' under the corresponding USR-001 profile. Several findings here originate there. The author thanks the dashboard.

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Q.E.D.