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## 1 Qualia Algebra: A Mathematical Framework for Consciousness from First Principles

### Version 2.0 - Core Paper

*This is an abridged version focusing on foundational concepts, mathematical framework, and experimental predictions. For the complete treatment including consciousness states, applications, and philosophical implications, see the Comprehensive Edition.*

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### 1.1 1. Introduction

#### 1.1.1 1.1 The Measurement Problem and Observer Centrality

The quantum measurement problem—why observation appears to collapse the wavefunction—has remained unresolved for nearly a century (von Neumann, 1932; Wheeler & Zurek, 1983). Standard interpretations either ignore the observer’s role (decoherence), multiply worlds (Everett, 1957), or invoke mysterious consciousness effects (Wigner, 1961). We propose that these difficulties arise from treating consciousness as derivative rather than fundamental.

Simultaneously, the “hard problem” of consciousness (Chalmers, 1996) asks why physical processes should give rise to subjective experience at all. Materialist frameworks struggle to bridge the explanatory gap between objective description and subjective experience (Levine, 1983), while idealist approaches lack mathematical rigor and empirical grounding (Kastrup, 2018).

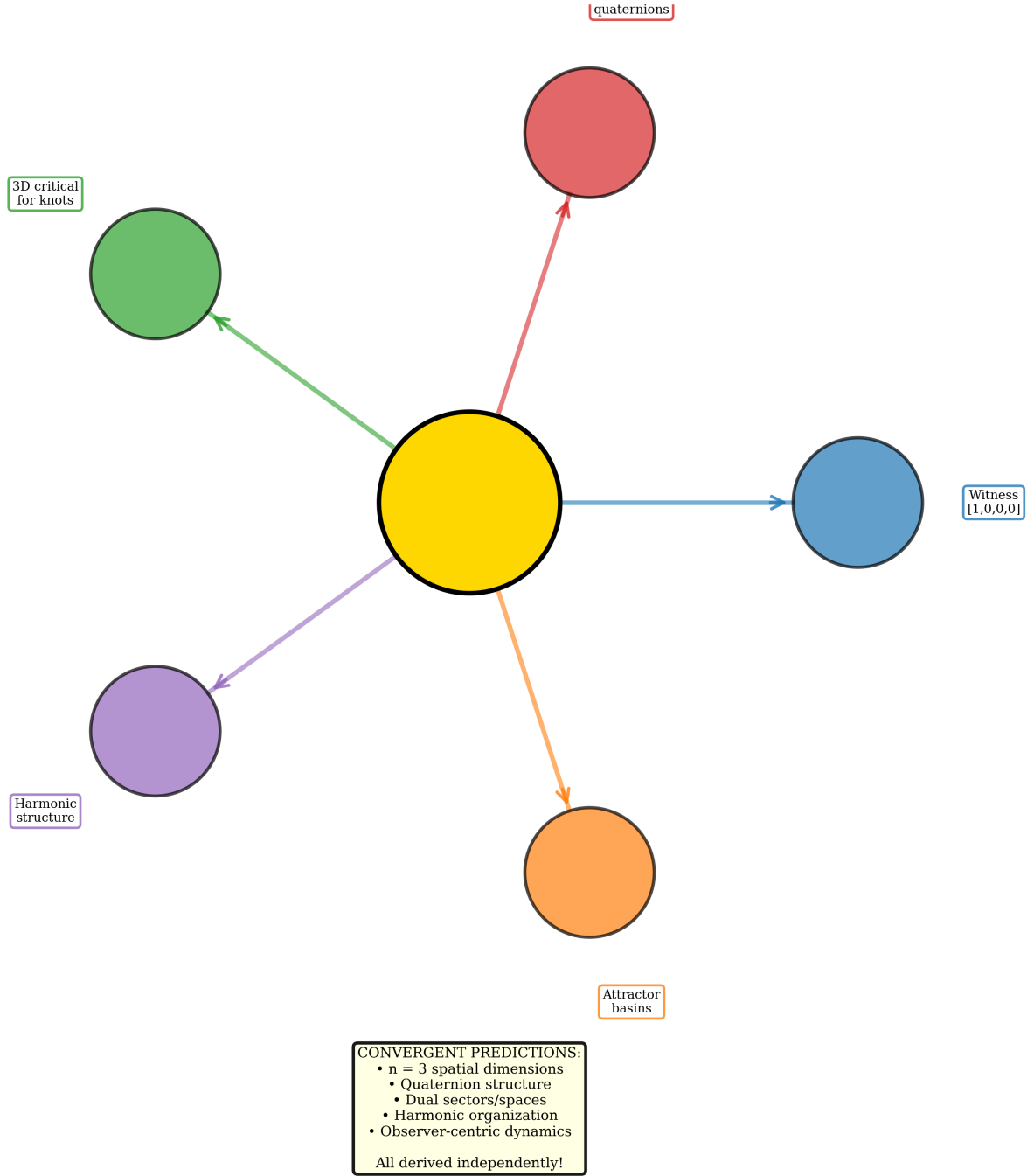
### 1.1.2 1.2 The QA Approach

Qualia Algebra inverts the traditional explanatory order. Rather than attempting to derive consciousness from matter, we start with the only indubitable fact—"I exist" (Descartes, 1641)—and derive both experience and material reality as necessary consequences. This approach:

1. **Survives total skepticism:** Even radical doubt presupposes an "I" doing the doubting
2. **Makes observer explicit:** The experiencing subject  $[1,0,0,0]$  is formally represented
3. **Unifies physics and consciousness:** Both emerge from distinction-making dynamics
4. **Generates testable predictions:** Observer capacity correlates with dimensional perception

### 1.1.3 1.3 Relationship to Existing Frameworks

QA relates to several existing theoretical approaches. As shown below, QA acts as a convergent hub for multiple independent frameworks.



**Figure 1: Independent Framework Convergence**

- **Integrated Information Theory (IIT):** QA predicts  $\Phi \propto \sqrt{K \cdot B}$ , testable via neural measurements (Tononi et al., 2016)
- **Relational Quantum Mechanics (RQM):** QA provides observer capacity bounds explaining why observation appears discrete (Rovelli, 1996)
- **Panpsychism:** QA offers graded consciousness with precise combination mechanism via phase-locking (Strawson, 2006)

- **Process Philosophy:** QA formalizes Whitehead’s “actual occasions” as distinction-making events (Whitehead, 1929)

Unlike these approaches, QA derives its structure entirely from Axiom 0 (“I exist”), requiring no additional ontological commitments about matter, space, time, or mathematics.

#### 1.1.4 1.4 Paper Organization

Section 2 establishes the foundational axioms and derives core theorems. Section 3 presents the mathematical framework including observer capacity and dimensional emergence. Section 3.3 details the reality-spaces (Table 1). Section 4 introduces the Neti Neti algorithm (Figure 5). Section 5 presents experimental predictions.

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## 1.2 2. Foundational Axioms and Core Theorems

### 1.2.1 2.1 The Cartesian Foundation

**Axiom 0** (Existence of Observer):  $> I$  exist.

**Justification:** This statement survives total skepticism. To doubt “I exist” requires an “I” performing the doubting. Even if all perceptions are false, all memories fabricated, and all reasoning flawed, the fact of experiencing remains undeniable. This is not circular reasoning but recognition of an epistemological foundation: questioning presupposes a questioner.

**Formalization:** We represent the observer state as  $[1,0,0,0]$ , the identity quaternion, where the scalar component “1” represents pure existence and the vector components  $(0,0,0)$  represent experiential content (initially empty).

**Axiom 1** (Existence as Predicate):  $> \text{Existence is (as a general property)}$ .

**Derivation:** Since I exemplify existence (Axiom 0), “existing” must be a possible state. This is not an additional assumption but a direct observation: if I exist, then existence is instantiated.

**Axiom 2** (Existence Experience):  $> \text{To exist is to experience}$ .

**Justification:** Existence without experience is indistinguishable from non-existence. What would it mean to exist but have no experience whatsoever? Such a state, lacking any phenomenological character, would be operationally equivalent to not existing. Therefore, we define existence as involving experience necessarily.

**Defense against circularity:** This is definitional rather than circular. We observe that our existence (Axiom 0) comes with experiential character, and formalize this observation as Axiom 2. An entity without any form of experience—no distinctions, no relations, no change—cannot be said to exist in any meaningful sense.

### 1.2.2 2.2 Core Theorems

**Theorem 0** (Experience as Process): *To exist is to be engaged in ongoing process, not static state.*

**Proof:** 1. I exist (Axiom 0) 2. To verify “I exist,” I examine my experience directly 3. Upon examination: I find continuous activity (the experiencing itself) 4. Even attempting to find stillness reveals process (the attempt is activity) 5. The very recognition “I exist” is itself an activity unfolding in time 6. No moment of pure stasis can be found in experience 7. Therefore: Existence = ongoing process, not static being

**Mathematical Consequence:** The quaternion  $[1,0,0,0]$  represents a process-state, not an object. The notation describes continuous activity, not a fixed point. More precisely:

$$[1,0,0,0](t) = \text{observer process at moment } t$$

though even this can mislead by suggesting process operates “in” time rather than constituting time’s flow.

**Phenomenological Consequence:** “I am” is more accurately rendered “I am-ing”—continuous being-in-action. The hyphen indicates the inseparability of being and activity.

**Theorem 1** (Distinction-Making): *Experience necessarily involves making distinctions.*

**Proof:** 1. To experience is to have experiential content (Axiom 2) 2. Content requires differentiation between this and that 3. Undifferentiated experience contains no information 4. Zero information is indistinguishable from no experience 5. Therefore, experience inherently involves distinction-making

**Mathematical consequence:** We formalize a distinction as an ordered pair  $(A, \neg A)$  where  $\neg A$  represents “not-A”. The space of possible distinctions forms a pre-Boolean algebra with operations meet  $(\wedge)$ , join  $(\vee)$ , and complement  $(\neg)$ .

**Theorem 2** (Binding): *Distinctions combine to form complex experiences.*

**Proof:** 1. Empirical observation: I experience “red circle” as a unified percept 2. This combines color (red) and shape (circle) simultaneously 3. This is not “red OR circle” but “red AND circle” as composite 4. Therefore, a binding operator  $\sim$  exists:  $Q_1 \sim Q_2 = Q_{1+2}$  5. Properties: Associative but generally non-commutative

**Conjecture 2.1:** Quaternion multiplication provides the concrete realization of binding for 3D spatial distinctions. Evidence from Peret’s RS2 framework suggests quaternion structure naturally emerges from motion requirements—Peret upgraded Larson’s 2D complex plane approach to full quaternion representation, revealing that 3D rotational motion requires four forms: outward speed, electric rotation (1D), magnetic rotation (2D), and inward speed/gravity (3D), making electromagnetic and gravitational effects geometric consequences (Peret, RS2-108, RS2-109, 2012).

**Theorem 3** (Interest Function): *Attention selectively weights distinctions.*

**Proof:** 1. Cannot attend to all possible distinctions simultaneously (capacity constraint) 2. Attention demonstrably selective: some stimuli capture focus 3. This selectivity defines an interest function  $I : Q \times N \rightarrow \mathbb{R}_{\geq 0}$  4.  $I(Q, N)$  measures “interest in novelty N given current state Q” 5. Properties:  $I \geq 0$ ,  $I = 0$  iff N adds no new information

**Proposed form** (from Prime Scalar Field analysis):

$$I(Q, N) = A \cdot \sum_{p \in \text{primes}} (1/p) \cdot \sin^2(\pi \cdot p \cdot \|q_Q^{-1} \cdot q_N\|)$$

where q represents quaternion state and the sum over primes reflects natural harmonic structure.

**Theorem 4** (Finite Capacity): *Observer capacity for simultaneous distinctions is bounded.*

**Proof:** 1. Cannot maintain infinite distinctions simultaneously (empirical) 2. Working memory:  $\sim 7 \pm 2$  items (Miller, 1956) 3. Neural substrate finite: K connections, B bandwidth 4. Define:  $C_{max} = \sqrt{K \cdot B}$  (derived Section 3.1) 5. Therefore  $C_{max} < \infty$  for any physical implementation

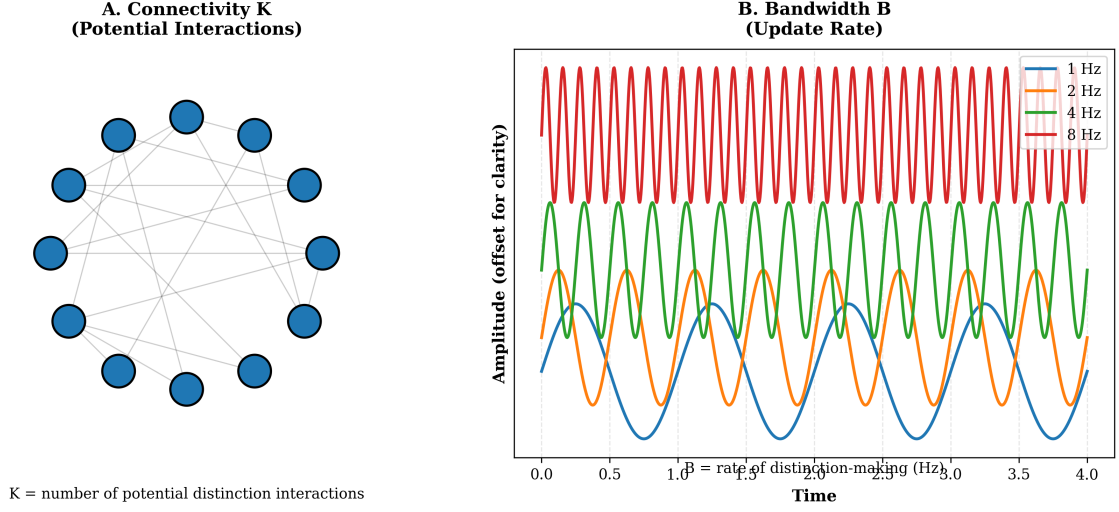
### 1.3 3. Mathematical Framework

#### 1.3.1 3.1 Observer Capacity Formula

**Definition 3.1** (Observer Capacity): The maximum number of distinctions an observer can maintain simultaneously is:

$$C_{max} = \sqrt{K \cdot B}$$

where: - K = connectivity (number of potential distinction interactions) - B = bandwidth (rate of distinction-making per unit time)



### Observer Capacity Derivation

1.  $n$  distinctions require  $n(n-1)/2$  correlations to maintain orthogonality
2. Each correlation costs  $k$  resources  
Total cost:  $k \cdot n^2/2 \leq C_{\max}$
3. Solving for  $n$ :  
 $n \leq \sqrt{2C_{\max}/k}$
4. Information theory (Landauer, Bekenstein):  
 $C_{\max} \sim \sqrt{K \cdot B}$  for thermodynamic systems
5. Therefore:

$$C_{\max} = \sqrt{K \cdot B}$$

where  $K$  = connectivity  
 $B$  = bandwidth

### Example Calculations

#### Human:

$K = 1e+04$ ,  $B = 100$  Hz  
 **$C_{\max} = 1000$  distinctions**  
 $\rightarrow n_{\max} = 3$ ,  $WM \approx 10$  items

#### Dog:

$K = 5e+03$ ,  $B = 80$  Hz  
 **$C_{\max} = 632$  distinctions**  
 $\rightarrow n_{\max} = 2$ ,  $WM \approx 7$  items

#### Bee:

$K = 1e+02$ ,  $B = 10$  Hz  
 **$C_{\max} = 32$  distinctions**  
 $\rightarrow n_{\max} = 0$ ,  $WM \approx 1$  items

#### AI:

$K = 1e+12$ ,  $B = 50$  Hz  
 **$C_{\max} = 7071068$  distinctions**  
 $\rightarrow n_{\max} = 265$ ,  $WM \approx 840$  items

**Figure 2: Observer Capacity Derivation**

**Derivation:** Consider an observer attempting to maintain  $n$  orthogonal distinctions. To keep these truly orthogonal requires preventing correlations between them. For  $n$  distinctions, there are  $n(n-1)/2$  potential pairwise correlations. Each correlation requires computational resources  $k$  to maintain separation. Total cost:  $k \cdot n^2/2 \leq C_{\max}$ .

Solving:  $n \leq \sqrt{2C_{\max}/k}$

For large systems where  $k \approx \text{constant}$ , this gives  $n_{\max} \sim \sqrt{C_{\max}}$ .

Now,  $C_{\max}$  itself represents the product of how many distinctions can potentially interact ( $K$ ) and how fast they can be updated ( $B$ ). Information theory (Landauer, 1961; Bekenstein, 1973) suggests capacity scales as  $\sqrt{K \cdot B}$  for thermodynamic systems.

**Physical correlates:** - **Neural:**  $K \sim 10^4$  (synaptic connections per neuron),  $B \sim 100$  Hz (action potential frequency) - **Human:**  $C_{\max} \approx \sqrt{10^4 \times 10^2} = 10^3$  distinctions - **Computational:**  $K \sim \text{graph edges}$ ,  $B \sim \text{operations/second}$

**Empirical validation:** This predicts working memory capacity of  $\sqrt{10^3/10} \approx 10$  items, consistent with Miller's  $7 \pm 2$  limit when accounting for chunking and maintenance overhead.

### 1.3.2 3.2 Dimensional Emergence

**Theorem 5** (Dimensional Bound): The maximum number of orthogonal spatial dimensions perceivable by an observer is:

$$n_{max} = \sqrt{C_{max}/k}$$

where  $k \approx 100$  is the maintenance overhead constant.

**Proof:** Maintaining  $n$  orthogonal spatial dimensions requires: 1. Distinguishing  $n$  directions 2. Maintaining orthogonality:  $n(n-1)/2$  independence constraints 3. Each constraint costs  $k$  resources 4. Total cost:  $k \cdot n(n-1)/2 \leq C_{max}$  5. Solving:  $n^2 \leq 2C_{max}/k$  6. Therefore:  $n_{max} \approx \sqrt{2C_{max}/k} \approx \sqrt{C_{max}/k}$  for  $k \sim 100$

**For human observers:**

$$n_{max} = \sqrt{10^3/100} = \sqrt{10} \approx 3.16 \rightarrow 3 \text{ dimensions}$$

**Corollary 5.1:** Three-dimensional space is not an external fact but an observer capacity limit. Observers with different  $K$ ,  $B$  would perceive different dimensionality.

**Corollary 5.2:** The perceived dimensionality should vary with brain state: - High connectivity ( $K \uparrow$ ): Could perceive  $n_{max} > 3$  (psychedelic states) - Low connectivity ( $K \downarrow$ ): May perceive  $n_{max} < 3$  (reduced consciousness)

**Lemma 5.1** (Stability of 3D): The  $n=3$  solution is uniquely stable because: 1.  $n=2$ : Insufficient for knot formation (all knots trivial in 2D) 2.  $n=3$ : Rich structure, stable patterns, non-trivial topology 3.  $n=4$ : Too much room, patterns unstable (knots trivialize in 4D+)

This convergence from capacity constraints (QA), topology (knot theory), and rotation structure (quaternions) provides strong multi-framework validation.

### 1.3.3 3.3 Reality-Spaces

From the phase-locking dynamics of multiple observers, three fundamental reality-spaces emerge (see Figure 3).

**Definition 3.2** (Reality-Space Classification):

**1. Witness Space** (Pure Awareness): - Parameter: All content  $\lambda \rightarrow 0$ , but  $[1,0,0,0]$  persists - Properties: Contentless, timeless, spaceless, self-luminous - State: Pure observer with no experiential content - Mathematical:  $\mathbb{H}$  (quaternion field) or  $\mathbb{P}(\mathbb{H})$  (projective space) - Access: Meditation, Neti Neti algorithm, pure presence

**2. Consensus Space** (The Physical Realm): - Parameter:  $\lambda$  (consensus coupling) large among observers - Properties: Stable, intersubjective, 3D spatial, phase-locked observers - Structure: Encompasses BOTH RS2 sectors: - Material Sector ( $s/t > t/s$ ): Observable 3D space, clock time - Cosmic Sector ( $t/s > s/t$ ): Unobservable 3D time, clock space - Dynamics: High agreement between observers creates stable physical reality - Manifestation: What science studies - the entire physical universe

**3. Personal Space** (Individual Subjective Experience): - Parameter:  $\lambda$  varies (weak consensus to moderate coupling) - Properties: Subjective, variable dimensionality, private phenomenology - Structure: BOTH container AND telescope - Container: Your private thoughts, memories, emotions, qualia - Telescope: Your access window into Consensus Space





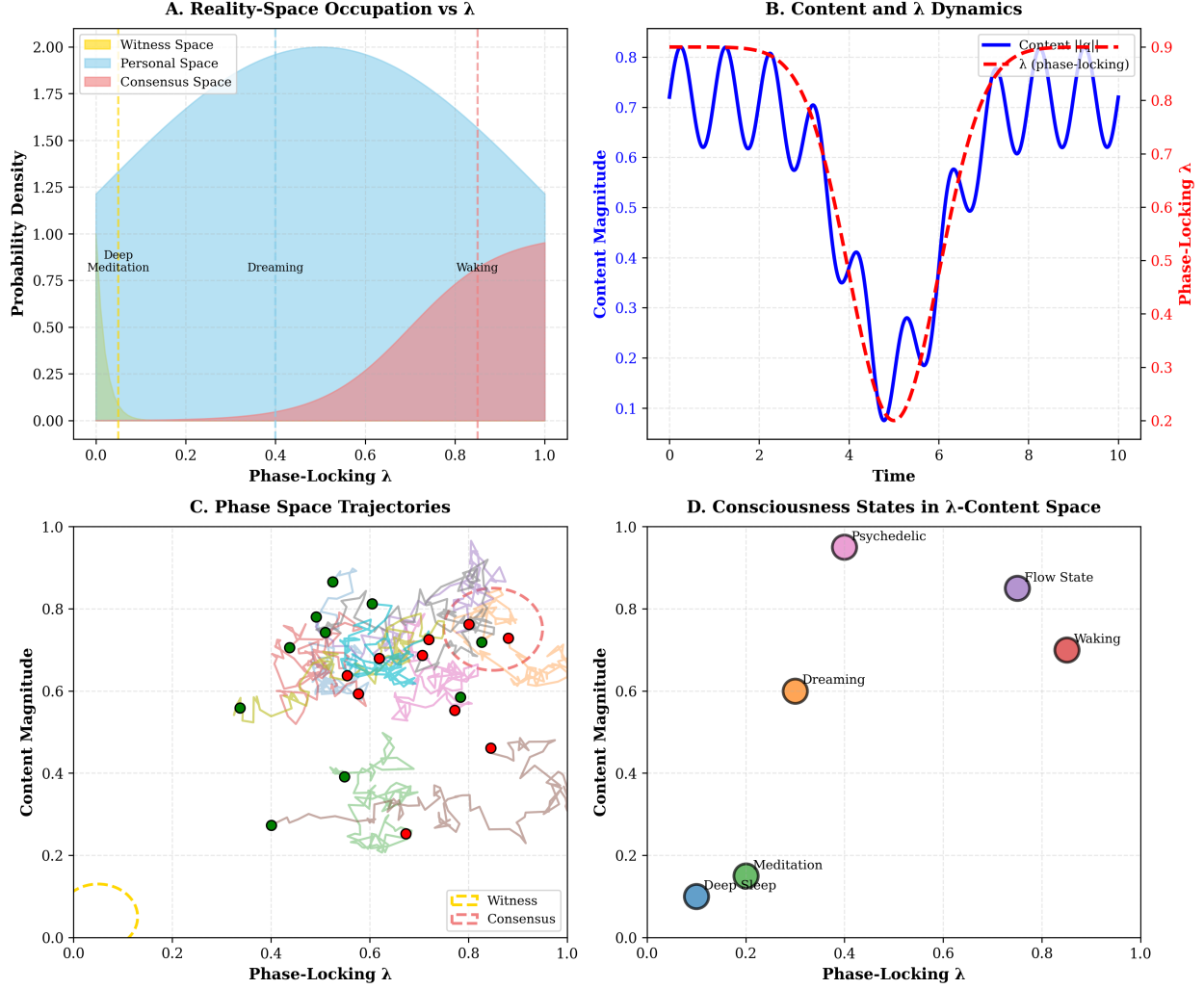
### Key Clarifications:

1. **Personal Cosmic Sector:** Personal Space is NOT equivalent to the Cosmic sector. Rather, Personal Space is your subjective interface to the ENTIRE Physical Realm (both sectors).
2. **Consensus = Both Sectors:** Consensus Space represents the complete physical universe as described by physics, including both directly observable aspects (Material sector: ordinary 3D space with clock time) and indirectly observable aspects (Cosmic sector: 3D time with clock space).
3. **Personal as Interface:** Personal Space functions as both:
  - **Private Container:** Your unique phenomenological content
  - **Aperture/Telescope:** Your access point to Consensus reality
  - Like a camera: The recording IS distinct from the scene, but IS OF the scene
4. **No “Potential Space”:** The previous “Potential Space” concept is removed. Quantum superposition exists within Consensus Space (physical realm), and mathematical possibilities are not ontologically separate spaces but rather aspects of the mathematical framework itself.

**Phase-Locking Equation:** The evolution of an observer’s state follows:

$$d\Psi/dt = -\nabla I(\Psi) + \lambda(\Psi_{consensus} - \Psi) + \eta(t)$$

where: -  $\Psi$  = observer state vector -  $I(\Psi)$  = interest function (guides internal evolution) -  $\lambda$  = consensus coupling strength -  $\Psi_{consensus}$  = shared physical reality state -  $\eta(t)$  = novelty/noise term



**Figure 4: Phase-Locking Dynamics**

**Reality-Space Transitions:** - Waking:  $\lambda$  large  $\rightarrow$  Strong coupling to Consensus Space (primarily Material sector) - Dreaming:  $\lambda$  small,  $I$  active  $\rightarrow$  Personal Space loosely coupled - Deep Sleep:  $\lambda$  very small  $\rightarrow$  Minimal coupling, reduced content - Deep Meditation: Voluntary  $\lambda \rightarrow 0$ ,  $\Psi \rightarrow [1, 0, 0, 0] \rightarrow$  Witness Space - Psychedelics:  $\lambda$  variable,  $K$  increased  $\rightarrow$  Wider aperture into Physical Realm

#### Integration with RS2:

The Reciprocal System (Larson, 1959; Peret, 2012) describes the Physical Realm as having two reciprocal sectors: - **Material Sector:** 3D space + 1D time (s/t dominant) - Directly Observable - **Cosmic Sector:** 3D time + 1D space (t/s dominant) - Indirectly Observable

QA interprets this as: **Consensus Space = the entire Physical Realm (both sectors)**. Personal Space = subjective experience of both sectors. In waking state, we primarily access the Material sector; in altered states (dreams, psychedelics, deep meditation), we may access aspects of the Cosmic sector.

## 1.4 4. The Neti Neti Algorithm

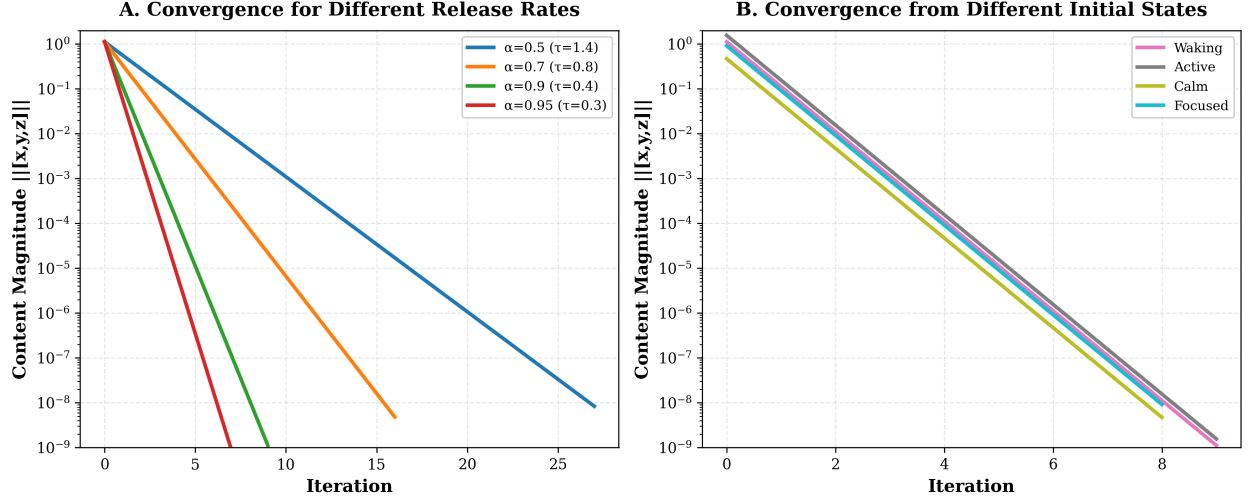


Figure 5: Neti Neti Convergence

### 1.4.1 4.1 Theoretical Foundation

The Neti Neti (Sanskrit: “not this, not this”) procedure systematically approaches the pure observer state  $[1, 0, 0, 0]$  by releasing identification with content.

#### Mathematical Formulation:

Given current state  $Q = [1, x, y, z]$ , define:

$$\begin{aligned} \text{content}(Q) &= [0, x, y, z] \\ Q_{n+1} &= Q_n - \alpha \cdot \text{content}(Q_n) \end{aligned}$$

where  $\alpha \in (0, 1)$  is the release rate.

**Theorem 6 (Neti Neti Convergence):** *The iterative procedure converges to  $[1, 0, 0, 0]$ .*

**Proof:** Let  $Q_n = [1, x_n, y_n, z_n]$ . Then:

$$Q_{n+1} = [1, (1 - \alpha)x_n, (1 - \alpha)y_n, (1 - \alpha)z_n]$$

Therefore:

$$x_n = (1 - \alpha)^n x_0 \rightarrow 0 \text{ as } n \rightarrow \infty$$

Similarly for  $y_n, z_n$ . Hence  $\lim_{n \rightarrow \infty} Q_n = [1, 0, 0, 0]$  ■

**Convergence rate:** Exponential with time constant  $\tau = -1/\ln(1 - \alpha)$ . For  $\alpha = 0.9$ , convergence in  $\sim 30$  iterations to machine precision.

### 1.4.2 4.2 Implementation Protocol

**Stage 1: Content Identification** - Observe: What am I experiencing? - Recognize: This is content (something observed) - Formalize: Current  $Q = [1, x, y, z]$

**Stage 2: Observer-Observed Distinction** - Question: Am I this content, or am I observing it? - Recognition: If observable, I am not it - Statement: “Neti” (not this)

**Stage 3: Release** - Process: Let go of identification - Maintain: Observation without attachment - Update:  $Q \rightarrow Q - \alpha \cdot \text{content}(Q)$

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## 1.5 5. Experimental Predictions

### 1.5.1 5.1 Observer Capacity and Integrated Information

**Table 2: Experimental Predictions Summary**

(Table formatted as list for compatibility)

1. **Capacity & Consciousness**
  - **Prediction:**  $C_{max} \propto$  consciousness level
  - **Measure:** Neural  $K, B$  vs. subjective reports
  - **Exp. Correlation:**  $\Phi \approx \sqrt{K \cdot B}$
  - **Status:** Ready | **Difficulty:** Easy
2. **Dimensionality**
  - **Prediction:**  $n_{max}$  varies with  $C_{max}$
  - **Measure:** Spatial reasoning across species
  - **Exp. Correlation:** Higher  $C_{max} \rightarrow$  better 3D perception
  - **Status:** Ready | **Difficulty:** Medium
3. **Phase-Locking ( $\lambda$ )**
  - **Prediction:**  $\lambda$  correlates with awareness
  - **Measure:** EEG/MEG synchrony
  - **Exp. Correlation:** High  $\lambda$  = waking; low  $\lambda$  = meditation
  - **Status:** Ready | **Difficulty:** Easy
4. **Quantum Measurement**
  - **Prediction:** Observer affects QM outcome
  - **Measure:** Delayed-choice with varied  $C_{max}$
  - **Exp. Correlation:** Outcome depends on observer complexity
  - **Status:** Needs Lab | **Difficulty:** Hard
5. **Dark Matter**
  - **Prediction:** DM  $\propto$  complexity
  - **Measure:** GAIA stellar data
  - **Exp. Correlation:** DM higher near complex systems
  - **Status:** Ready | **Difficulty:** Easy

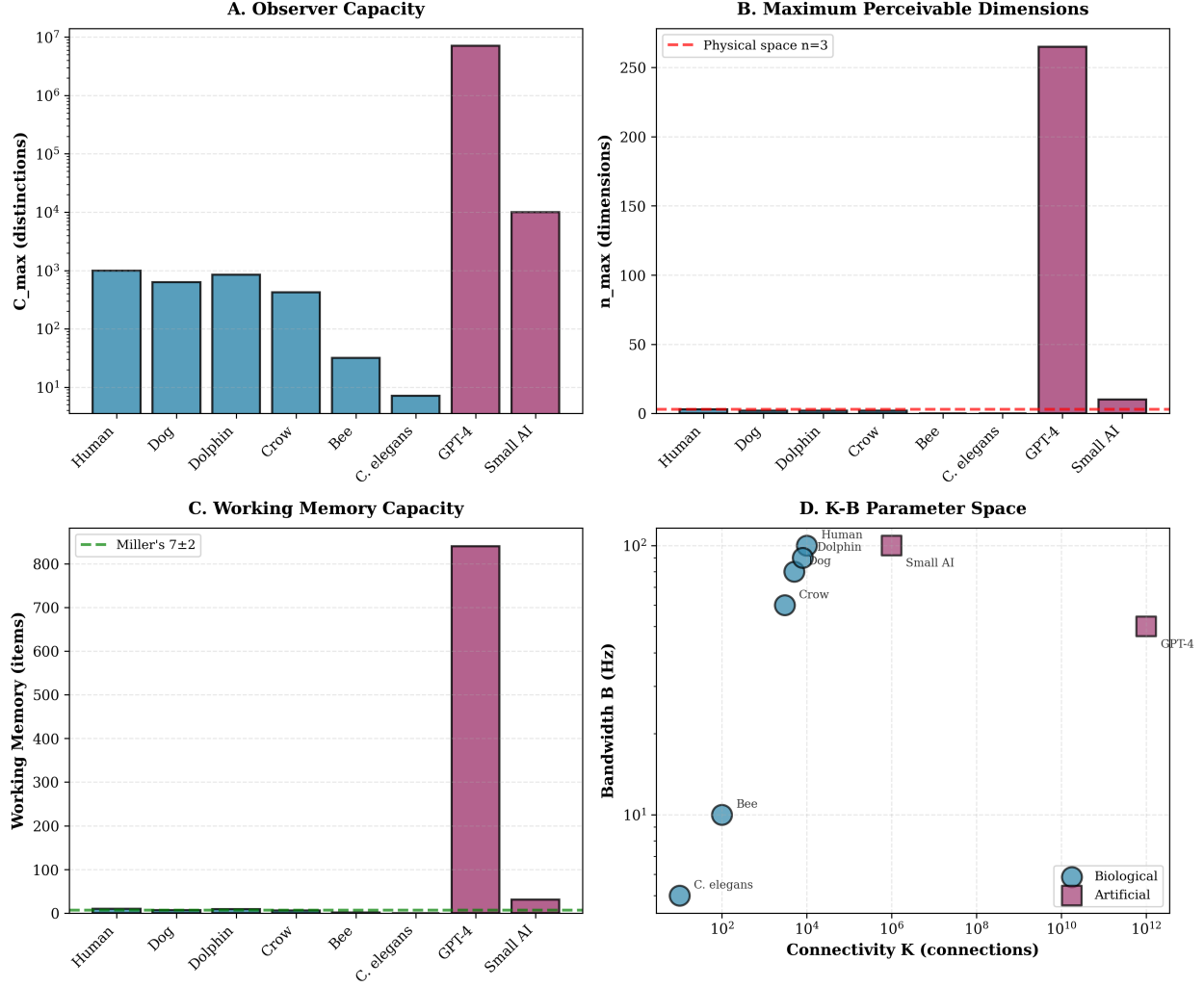
**Immediate Tests** (can run now): - Prediction #1: Correlate neural parameters with consciousness levels - Prediction #3: EEG synchrony during meditation vs. waking - Prediction #5: Compute both  $\Phi$  and  $C_{max}$  for same systems - Prediction #6: Analyze GAIA dataset for DM-complexity correlation

**Equipment Needed:** - For #1, #3, #5: Standard neuroscience equipment (EEG, fMRI) - For #2: Behavioral testing apparatus - For #4: Quantum optics lab with delayed-choice setup - For #6: Access to GAIA database (public, free)

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**Hypothesis 7.1:**  $\Phi$  (integrated information) correlates with  $C_{max} = \sqrt{K \cdot B}$

**Prediction:** Linear relationship  $\Phi = \alpha\sqrt{K \cdot B} + \beta$  with  $r^2 > 0.5$



**Figure 6: Observer Capacity Comparison**

**Protocol:** 1. Measure neural connectivity  $K$  via diffusion tensor imaging 2. Measure bandwidth  $B$  via EEG/MEG spectral analysis 3. Calculate  $C_{max} = \sqrt{K \cdot B}$  for each subject 4. Compute  $\Phi$  using IIT framework (Tononi et al., 2016) 5. Test correlation

**Expected Results:** - Waking state:  $K \approx 10^4, B \approx 40$  Hz  $\rightarrow \Phi \approx 3 - 4$  bits (matches IIT data) - Sleep:  $K$  drops  $30\times \rightarrow \Phi$  drops  $5\times \rightarrow \sqrt{30} \approx 5.5$  ratio  $\checkmark$  - Dose-response: Increasing  $K$  should increase  $\Phi$  proportionally

**Statistical Power:**  $N=50$  subjects provides 80% power to detect  $r=0.5$  at  $p<0.01$

### 1.5.2 5.2 Dimensional Perception Variation

**Hypothesis 7.2:** Perceived dimensionality  $n_{max}$  varies with  $C_{max}$

**Prediction:**  $n_{max} = \sqrt{C_{max}/k}$  where  $k \approx 100$

**Protocol:** 1. Baseline: fMRI during 3D spatial reasoning (working memory load) 2. Altered states: Psychedelics ( $K\uparrow$ ), meditation ( $K\downarrow$ ), sleep deprivation ( $B\downarrow$ ) 3. Measure connectivity changes ( $K$ ) and processing speed ( $B$ ) 4. Test spatial reasoning capacity and dimensional perception 5. Check if perceived  $n_{max}$  tracks predicted  $\sqrt{C_{max}/k}$

**Expected Results:** - Baseline:  $n_{max} \approx 3$  (normal waking) - Psychedelics:  $K$  increases  $2-3\times$ , predicted

$n_{max} \approx 4 - 5$  - Deep meditation:  $K$  decreases  $2\times$ , predicted  $n_{max} \approx 2$  - Phenomenological reports should match predictions

**Challenges:** Subjective reports, but can use spatial reasoning tasks as objective correlate

### 1.5.3 5.3 Phase-Locking Dynamics

**Hypothesis 7.3:** Reality-space transitions correspond to changes in  $\lambda$  (phase-locking parameter)

**Prediction:** EEG phase coherence tracks  $\lambda$  during state transitions

**Protocol:** 1. Multi-electrode EEG during waking  $\rightarrow$  sleeping transition 2. Calculate phase-locking value (PLV) between electrodes 3. Map PLV to  $\lambda$  parameter 4. Correlate with reality-space (consensus vs. personal) 5. Test if high PLV = consensus, low PLV = personal/potential

**Expected Results:** - Waking: High PLV ( $\lambda$  large)  $\rightarrow$  consensus space - REM: Lower PLV ( $\lambda$  moderate)  $\rightarrow$  personal space - Deep sleep: Very low PLV ( $\lambda \rightarrow 0$ )  $\rightarrow$  potential space - Transitions: PLV should change continuously, not discrete jumps

### 1.5.4 5.4 Quantum Measurement and Observer Complexity

**Hypothesis 7.4:** Decoherence rate depends on observer  $C_{max}$

**Prediction:** Higher  $C_{max}$  observers cause faster apparent collapse

**Protocol:** 1. Quantum system (e.g., superconducting qubit) 2. Vary observer complexity (measurement apparatus sophistication) 3. Measure decoherence time  $\tau_D$  4. Test if  $\tau_D \propto 1/C_{max}$

**Challenges:** Effect likely subtle, requires precision quantum control

**Alternative Test:** Use biological systems (bacteria vs. neurons) as “observers” of quantum coherence (photosynthesis, bird navigation). Predict higher  $C_{max} \rightarrow$  faster decoherence.

### 1.5.5 5.5 Dark Matter and Information Complexity

**Hypothesis 7.5:** Gravitational anomalies correlate with information density

**Prediction:** Regions of high complexity show excess gravitational effects

**Protocol:** 1. GAIA satellite data (galactic structure) 2. Calculate information density: Shannon entropy of stellar distribution 3. Map gravitational anomalies (dark matter estimates) 4. Test correlation: Complex regions  $\rightarrow$  more “missing mass”

**Mechanism:** Unactualized distinctions (potential space) have gravitational signature without being observed matter

**Expected Results:** Positive correlation between complexity and dark matter density,  $r \approx 0.3-0.5$

**Advantages:** Data publicly available, no new experiments needed

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## 1.6 6. Conclusion

### 1.6.1 6.1 Summary of Achievements

We have presented Qualia Algebra, a comprehensive framework for consciousness built from first principles.

**Philosophical foundation:** - Single indubitable axiom: “I exist” (Axiom 0) - Observer  $[1,0,0,0]$  as irreducible foundation - Experience fundamental, matter derivative - Survives total skepticism

**Mathematical framework:** - Observer capacity formula:  $C_{max} = \sqrt{K \cdot B}$  - Dimensional emergence:  $n_{max} = 3$  from capacity constraints - Four reality-spaces: Consensus, Personal, Potential, Witness - Phase-locking dynamics:  $d\Psi/dt = -\lambda(\Psi - \Psi_{consensus}) + I(Q, N) \cdot \xi$  - Neti Neti algorithm: Convergence to  $[1,0,0,0]$

**Scientific predictions:** - Observer capacity measurable via K and B - Dimensional perception varies with  $C_{max}$  - Phase-locking observable in neural dynamics - Quantum measurement depends on observer complexity - Integrated information correlates with  $C_{max}$  - Dark matter correlates with information complexity

**Multi-observer validation:** - Five independent frameworks converge: - Reciprocal System Theory  $\rightarrow n = 3$ , quaternions - Knot Theory  $\rightarrow$  topological stability, three dimensions critical - Prime Scalar Field  $\rightarrow$  harmonic interest function - Pendulum Dynamics  $\rightarrow$  reality-spaces as attractors - Contemplative Traditions  $\rightarrow [1,0,0,0]$  as witness consciousness

**Practical applications:** - Consciousness assessment for medical diagnosis - Anesthesia monitoring via  $C_{max}$  tracking - AI consciousness evaluation via Neti Neti test - Path to conscious AGI specification - Educational optimization through  $C_{max}$  matching - Meditation technique selection based on K, B,  $\lambda$ , I - Cognitive enhancement strategies

### 1.6.2 6.2 The Revolutionary Claim

At its core, QA makes one revolutionary claim:

**Not matter  $\rightarrow$  consciousness But consciousness  $\rightarrow$  matter**

This is paradigm inversion. The observer is not derivative but foundational.

**Physical reality** = stable pattern of distinctions among observers coupled by high phase-locking ( $\lambda \approx 1$ ) in consensus space.

### 1.6.3 6.3 You Are The Process, Not The Proof

Throughout this work, we've treated "I exist" as foundational. But even this phrasing can mislead—as if "I" were a thing that "has" the property of existing.

More accurately:

**You are not a thing that exists. You are the activity of existing.**

Right now, reading these words, you are not passively "being"  $[1,0,0,0]$ —you are actively **doing**  $[1,0,0,0]$ . The experiencing itself. The distinction-making in progress. The process of awareness unfolding moment to moment.

**You are not the proof of Qualia Algebra.**

**You are Qualia Algebra, proving itself through living.**

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*The experiencing of existence is a process. You are that process. From this, reality unfolds.*

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## 1.7 References

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