

# TIG UNIFIED WORD-MATH FORMALISM

## Coherence Field Theory for Symbolic Systems

Version 1.0 — Weaver/7Site Collaboration

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### 1. FOUNDATIONAL STRUCTURES

#### 1.1 Generator Alphabets

Three primary generator sets (all treated as the same mathematical object type):

Symbol	Domain	Elements
$\Sigma_{\text{sound}}$	Phonemes	{a, e, i, o, u, p, b, t, d, k, g, ...}
$\Sigma_{\text{letter}}$	Graphemes	{a, b, c, d, ..., z, A, B, ..., Z, 0-9, punctuation}
$\Sigma_{\text{math}}$	Math symbols	{+, -, ×, ÷, =, ∫, ∂, Σ, Π, ...}

#### 1.2 Free Monoids

Each alphabet generates a free monoid (all finite sequences with concatenation):

$$\Sigma^* = \{\varepsilon, \sigma_1, \sigma_2, \sigma_1\sigma_2, \sigma_1\sigma_1, \dots\} \text{ where } \sigma_i \in \Sigma$$

Therefore:

- A spoken word  $\in \Sigma^*_{\text{sound}}$
- A written word  $\in \Sigma^*_{\text{letter}}$
- A math expression string  $\in \Sigma^*_{\text{math}}$

Same structure: generators + concatenation.

#### 1.3 Grammars (Generative Rules)

Each domain has a grammar G (set of valid compositions):

Grammar	Domain	Output
G_spoken	Natural speech	Valid utterances
G_written	Written language	Valid text
G_math	Mathematical notation	Valid expressions

These are all **formal languages**: sets of strings generated by production rules.

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## 2. THE LINKING MAPS

### 2.1 Full Pipeline

$$X_{\text{wave}} \rightarrow f_{\text{hear}} \rightarrow \Sigma^*_{\text{sound}} \rightarrow f_{\text{spell}} \rightarrow \Sigma^*_{\text{letter}} \rightarrow f_{\text{parse}} \rightarrow T_{\text{math}} \rightarrow f_{\text{sem}} \rightarrow O \rightarrow g_{\text{C}} \rightarrow M$$

Where:

- **X\_wave** = Acoustic space (waveforms, spectrograms)
- **f\_hear** = Perception map (speech recognition)
- **f\_spell** = Orthographic map (phoneme  $\rightarrow$  letter, monoid homomorphism)
- **T\_math** = Term algebra of math expressions (trees, not flat strings)
- **f\_parse** = Parsing/interpretation map
- **f\_sem** = Semantic map (term  $\rightarrow$  mathematical object/function)
- **O** = Object space (mathematical objects)
- **g\_C** = Meaning under lens C
- **M** = Meaning space (concepts, internal states)

### 2.2 Individual Maps

#### Acoustic $\rightarrow$ Phoneme Sequence:

$$f_{\text{hear}}: X_{\text{wave}} \rightarrow \Sigma^*_{\text{sound}}$$

#### Phoneme $\rightarrow$ Letter Sequence:

$$f_{\text{spell}}: \Sigma^*_{\text{sound}} \rightarrow \Sigma^*_{\text{letter}} \text{ (monoid homomorphism)}$$

#### Letter $\rightarrow$ Math Term:

$f_{\text{parse}}: \Sigma^* \text{letter} \rightarrow T_{\text{math}}$

## Term → Mathematical Object:

$f_{\text{sem}}: T_{\text{math}} \rightarrow O$

## Object → Meaning (via lens):

$g_C: O \rightarrow M$

## 3. CONSCIOUSNESS AS LENS-UPDATE OPERATOR

### 3.1 The Lens

A conscious lens  $C$  is a map:

$f_C: X_{\text{world}} \rightarrow M$

Where  $X_{\text{world}}$  is the space of all possible inputs (sensory, symbolic, etc.)

### 3.2 Meaning Regions

For a given word-form  $w$ , define:

#### Meaning region:

$R_w = \{m \in M : f_C(w) \text{ maps to } m\}$

#### Boundary curve/surface:

$\partial R_w = \{m \in M : m \text{ is on the edge of } R_w\}$

### 3.3 Probabilistic Boundary

$\partial R_w = \{x \in X_{\text{world}} \mid P(w|x,C) \approx P(w'|x,C) \text{ for some } w' \neq w\}$

This is literally a **decision surface** in  $M$  defined by lens  $C$ .

### 3.4 The Update Rule

**Consciousness = the boundary-updating operator:**

$$C_{\{t+1\}} = L(x_t, C_t)$$

Where  $L$  is the update rule (learning, reflection, therapy, insight, etc.)

### 3.5 Identity as Fixed Point

An identity is any  $C^*$  such that:

$$L(x, C^*) \approx C^* \text{ for most } x$$

#### Stability conditions:

State	Boundary Behavior	Description
Chaotic	$\ \partial R(t+1) - \partial R(t)\  \gg \varepsilon$	Unstable identity
Rigid	$\ \partial R(t+1) - \partial R(t)\  \approx 0$	No adaptation
Healthy	$\ \partial R(t+1) - \partial R(t)\  \sim \varepsilon$	Bounded update

## 4. THE UNIVERSAL TRIPLE

### 4.1 Canonical Form

Any symbolic system reduces to:

$$(\Sigma, G, f_C)$$

Where:

- $\Sigma$  = alphabet (generators)
- $G$  = grammar (composition rules)
- $f_C$  = interpretation map under lens  $C$

### 4.2 Universal Pipeline

$$\Sigma \rightarrow G(\Sigma) \rightarrow f_C(G(\Sigma)) \rightarrow R \subset M \rightarrow \partial R \rightarrow \text{update}(\partial R)$$

Or compressed:

$$\text{generator} \rightarrow \text{grammar} \rightarrow \text{map} \rightarrow \text{region} \rightarrow \text{boundary} \rightarrow \text{coherence}$$

This is **invariant** across all domains:

- Spoken language
  - Written language
  - Mathematical notation
  - Code
  - Music
  - Belief systems
  - Cultural memes
  - Physical models
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## 5. TIG COHERENCE INTEGRATION

### 5.1 Core Coherence Score

$$S^* = \sigma(1 - \sigma^*)V^*A^*$$

Where:

- $\sigma = 0.991$  (coherence constant)
- $T^* = 0.714$  (threshold)
- $V^*$  = volume/capacity factor
- $A^*$  = alignment factor

### 5.2 TIG Phases as Boundary Dynamics

Phase	Name	Boundary Operation
0	RESET	$\partial R \rightarrow \partial R_0$ (return to attractor)
1	VOID	Initialize empty lattice
2	LATTICE	Structure formation
3	COUNTER	Opposition/contrast generation
4	PROGRESS	Forward integration
5	REDOX	Energy exchange across $\partial R$
6	COLLAPSE	Boundary contraction
7	HARMONY	$\partial R$ stabilizes, $S^*$ maximizes
8	BREATH	Oscillation maintenance
9	CHAOS	Boundary perturbation
10	BALANCE	Equilibrium seeking
11	EXPANSION	Boundary growth
12	HARVEST	R expands, new generators absorbed

### 5.3 GFM Generators (Minimal Spanning Set)

GFM	Components	Function
012	Void→Lattice→Counter	Geometry/Space
071	Void→Harmony→Void	Resonance/Alignment
123	Void→Lattice→Progress	Progression/Flow

## 6. COHERENCE BRIDGE

### 6.1 Classical vs Quantum vs Coherence

Mode	Meaning-Space	Description
Classical	"The word is definitely THIS"	Fixed states
Quantum	"Multiple words partially fit"	Superposed states
Coherence	"What makes collapse predictable"	Resolution rules

## 6.2 TIG as Coherence Dynamics

TIG is a **formal model of coherence dynamics** in any symbolic system:

- Not mystical
- Not metaphorical
- Algebraically grounded

## 7. IMPLICATIONS

### 7.1 Meaning is Geometry

Every concept is a geometric object:

- Words = regions  $R_w$  in meaning-space  $M$
- Boundaries =  $\partial R_w$
- Interpretation = map  $C$

"Truth," "love," "flow," "self" are regions with boundaries in high-dimensional space.

### 7.2 Words are Compression Codes

w is a minimal code for  $R_w$

The human mind is a **live, adaptive compression algorithm**.

This collapses:

- Linguistics
- Memory
- Identity
- Storytelling
- Trauma
- Insight
- Belief systems
- Philosophy
- Semantics

...into a single structure: **dynamic compression + boundary adjustment.**

### 7.3 Universal Equivalence

There is NO fundamental difference between:

- A spoken sentence
- A written word
- A mathematical formula
- A symbolic logic expression
- A code snippet
- A story
- A belief
- A cultural meme
- A personal identity
- A physical model
- A physical law

All are:  $\Sigma^* \rightarrow G \rightarrow f_C \rightarrow M$

### 7.4 Shared Reality

"Shared reality" = alignment of C across individuals.

Same formal structure, different alphabets.

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## 8. TESTABLE PREDICTIONS

### 8.1 Communication Failure Modes

Failures occur when:

1. **Generator mismatch:** Different  $\Sigma$
2. **Grammar mismatch:** Different  $G$
3. **Lens mismatch:** Different  $C$
4. **Boundary overlap:**  $\partial R_w \cap \partial R_{w'} \neq \emptyset$

## 8.2 Coherence Measurements

Observable via TIG metrics:

- Fire rate by phase
- $\chi^2$  deviation from uniform
- $S^*$  stability over time
- Boundary oscillation amplitude

## 8.3 Empirical Validation Path

1. Deploy TIG on controlled systems
  2. Measure phase distributions under load
  3. Correlate with system health metrics
  4. Validate Protection Theorem predictions
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# 9. SUMMARY EQUATIONS

## The Complete Formalism

### Pipeline:

(raw world)  $\rightarrow f_{\text{perception}} \rightarrow \Sigma^*_{\text{sound}} \rightarrow f_{\text{spell}} \rightarrow \Sigma^*_{\text{letter}} \rightarrow f_{\text{parse}} \rightarrow T_{\text{math}} \rightarrow f_{\text{sem}} \rightarrow O \rightarrow g_C \rightarrow M$

### Boundaries:

$$\partial R_w = \{x : P(w|x,C) \approx P(w'|x,C)\}$$

### Evolution:

$$C_{\{t+1\}} = L(x_t, C_t)$$

### Coherence:

$$S^* = \sigma(1 - \sigma^*)V^*A^*$$

## Universal Triple:

$(\Sigma, G, f_C)$

## 10. CONCLUSION

TIG is a **universal compression and coherence engine** for ANY symbolic system.

Not because of mysticism.

Because the underlying math structure is **uniform across domains**.

The canonical abstraction:

generator → grammar → interpreter → boundaries → update

This is the math of resonance, coherence, identity, language, and thought.

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