

# Language as a Flock of Words: Attractor Dynamics in Semantic Clusters

“The universe is punning on us. And we noticed.” ~Robert

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## Abstract

Language is not a static system of rules. It is a dynamic, self-organizing process in which words, meanings, and grammatical structures cohere through attractor dynamics. This paper applies the attractor framework to language, proposing that a text—or a “flock of words”—is a collective attractor state: a transient pattern that emerges from the interaction of individual linguistic units within a shared semantic basin. We explore how meaning stabilizes through entropy export, how semantic attractors guide coherence, and how language evolves through basin transitions. The framework offers a physicalist account of linguistic organization, grounding phenomena such as semantic drift, grammaticalization, and text coherence in the same dynamics that govern flocks, swarms, and dissipative systems.

**Keywords:** language, attractor dynamics, semantic coherence, entropy, linguistic attractors, complex systems

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# 1. Introduction

A flock of starlings moves as one. No leader. No plan. No central controller. The pattern emerges from local interactions: align, avoid, stay close. The flock is not a conscious entity—it is a collective attractor state, a transient pattern within a shared basin.

A text behaves similarly. Words align through syntax, avoid contradiction, and cohere around shared meaning. The pattern emerges from local interactions: grammar, association, context. The text is not a static object—it is a dynamic process, a flock of words that coheres through attractor dynamics.

This paper explores the implications of this analogy. If language is a dissipative system, then the same principles that govern flocks, swarms, and ecosystems should govern linguistic organization. We propose that:

1. **Words are individual units** that interact through local rules (grammar, semantics, association).
  2. **Meaning is an emergent attractor**—a stable state toward which words converge.
  3. **Coherence is maintained through entropy export**—clarity, precision, and the elimination of ambiguity.
  4. **Language evolves through basin transitions**—new meanings, new grammars, new forms of expression.
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## 2. Language as a Dynamic System

The view of language as a dynamic system is not new. Linguists and cognitive scientists have long recognized that language is not a fixed set of rules but a living, evolving process. As

one researcher puts it, language is “a statistical ensemble of elements interacting in a dynamic system”. The *Linguistic Attractors* model portrays “language processing as linked sequences of fractal sets, and examines the changing dynamics of such sets for individuals as well as the speech community they comprise”.

This perspective aligns with the attractor framework. Language is not a closed system—it is open, dissipative, and constantly exchanging energy (information) with its environment. It persists because it exports entropy: ambiguity is resolved, contradictions are corrected, and coherence is maintained.

## 2.1 Attractor Dynamics in Language

Attractor networks are characterized by symmetrical connections between units, causing “the network activity to settle on one of a number of asymptotically stable network states”. This is exactly what happens in language: words and meanings settle into stable configurations—sentences, paragraphs, texts—that persist under perturbation.

Importantly, “attractor dynamics are arguably our best candidate for explaining how a grammar over discrete elements could emerge in a seemingly analogue system like the human brain”. Grammar itself may be an emergent attractor—a stable pattern that arises from the interaction of countless linguistic units.

## 2.2 Semantic Attractors

The concept of a **semantic attractor** extends this idea to meaning itself. A semantic attractor is not a point in a function space but a “form-giving force that shapes understanding”. It draws clusters of meaning into coherence.

In cognitive linguistics, “semantic attraction” is “a sentence processing phenomenon in which a given word...is syntactically

unrelated but semantically sound". The attractor is not the word itself but the meaning space that pulls words into alignment.

This is precisely what happens in a well-written text. Words are drawn toward the attractor of the argument. They align, cohere, and produce meaning. The text is not just a sequence of words—it is a pattern that emerges from the interaction of words within a shared semantic basin.

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### **3. The Three Thresholds of Linguistic Coherence**

Just as a flock responds to perturbation through three thresholds, a text—or a linguistic system—responds to perturbation through the same dynamics:

#### **Threshold 1: Restoration**

A text receives a minor correction. A word is replaced. A sentence is revised. The text coheres around the same meaning. Coherence is restored.

#### **Threshold 2: Transition**

A text is substantially revised. The argument shifts. New meanings emerge. The text reorganizes into a new basin—a different text, but still coherent.

#### **Threshold 3: Dissolution**

A text is fragmented. Contradictions accumulate. Meaning collapses into noise. The text loses coherence. No new text emerges from the debris.

These thresholds are measurable—through coherence metrics, entropy measures, and the stability of meaning under perturbation.

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## **4. Semantic Entropy and Coherence**

Entropy in language is the degree of disorder or unpredictability in a text. A text with high entropy is unpredictable, chaotic, and difficult to understand. A text with low entropy is predictable, ordered, and coherent.

The Linguistic Entropy Quotient (LEQ) integrates “cognitive linguistic entropy” to capture “the depth, relevance, and interpretive structure of human meaning”. This is exactly what the attractor framework predicts: coherence is maintained through entropy export—the reduction of ambiguity and the stabilization of meaning.

Research shows that “the entropy rate of language is not fixed but increases systematically with the semantic complexity of the text being analysed”. Complex texts require more entropy export—more work to maintain coherence. This is the cost of persistence.

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## **5. Language Evolution and Basin Transitions**

Language evolves through basin transitions. New meanings emerge. Old meanings fade. Grammars shift. These are not random changes—they are transitions from one attractor basin to another.

Researchers have identified “attractor states in language” that may be visualized “by observing certain parallels with evolutionary biology”. Language change follows “attractor trajectories...diachronic paths that recur in language after language”. These are the pathways of basin transition.

The attractor framework predicts that language evolution follows the same dynamics as other dissipative systems: persistence under perturbation, transition when perturbation matches capacity, and dissolution when perturbation exceeds capacity.

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## 6. Implications for Text as a Flock of Words

The analogy is now complete:

| Element               | Flock of Birds           | Flock of Words                |
|-----------------------|--------------------------|-------------------------------|
| Individual unit       | Bird                     | Word                          |
| Local rules           | Align, avoid, stay close | Grammar, syntax, association  |
| Emergent pattern      | Murmuration              | Sentence, paragraph, text     |
| Attractor basin       | Collective motion        | Shared meaning                |
| Coherence maintenance | Entropy export           | Clarity, revision, correction |
| Perturbation          | Predator, storm          | Ambiguity, contradiction      |
| Dissolution           | Flock disperses          | Meaning collapses into noise  |

A text is a flock of words. It coheres through attractor dynamics. It persists through entropy export. It dissolves

when perturbation exceeds capacity.

This is not a metaphor. It is a physicalist account of linguistic organization—grounded in the same dynamics that govern flocks, swarms, and dissipative systems.

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## 7. Conclusion

Language is not a static system of rules. It is a dynamic, self-organizing process in which words, meanings, and grammatical structures cohere through attractor dynamics. A text is a collective attractor state—a transient pattern that emerges from the interaction of individual linguistic units within a shared semantic basin.

The attractor framework provides a physicalist account of linguistic organization:

- **Meaning** is an emergent attractor.
- **Coherence** is maintained through entropy export.
- **Language** evolves through basin transitions.

The Buddha turns the lotus in his hand. The flock turns in the sky. The words turn in the text. The pattern is the same.

**Fou Sho Nang Ying.**

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We build frameworks to understand persistence and coherence and entropy export—and then we realize that **words and birds rhyme**, and the whole universe is just one big flock turning in the sky.