Fractal-Wave Algebra: Information, Symmetry, Lu and the Dynamical Zero

1. Information as Distinction

In the FWA ontology, information is not treated primarily as a property stored in matter. It is associated with distinguishability: a departure from an ideal symmetric state. The basic relation is:

$$I = \delta S$$

Here I denotes information and δS denotes the minimal distinction from the reference symmetric state. Information therefore appears at the boundary between ideal symmetry and its realized configuration.

2. Symmetry as the Reference State

Symmetry defines the reference against which a state becomes distinguishable. It is not assumed that perfect symmetry is a directly observable object; it is a limiting reference state used to define deviation.

$$S = S[\Phi]$$

The realized symmetry is therefore associated with the actual field configuration Φ. A change in Φ can produce a corresponding change in the symmetry state.

3. Lu: The Minimal Gap

Lu denotes the minimal gap, or structural slack, between an ideal symmetric state and its physical realization. It is introduced to represent the fact that a realized state need not coincide exactly with the ideal limit.

$$Lu = S_{ideal} - S_{real}$$

In this ontology Lu is not simply an ordinary numerical error. It represents the minimal degree of differentiation through which a state can depart from perfect symmetry and acquire dynamical structure.

$$\text{ideal symmetry} \rightarrow Lu \rightarrow \text{distinction} \rightarrow \text{information}$$

4. Information, Symmetry and Dynamics

The relation between symmetry and information is treated as generative rather than merely descriptive. Once a distinction exists, the field can evolve from one state to another.

$$I = \delta S \rightarrow \Phi(t) \rightarrow \Phi(t + \Delta t)$$

The fundamental sequence is therefore:

$$\text{symmetry} \rightarrow \text{minimal deviation} \rightarrow \text{information} \rightarrow \text{field dynamics}$$

This establishes information as a structural condition for differentiation while leaving the physical evolution to the dynamics of the field.

5. Dynamical Zero 0′

The FWA dynamical zero is deliberately distinguished from ordinary numerical zero.

$$0' \neq 0$$

Ordinary zero denotes the absence of numerical magnitude in a given mathematical context. The dynamical zero denotes a transition condition: a state at which differentiation can begin without treating the differentiated structure as a pre-existing object.

$$0' = 0 + \delta$$

Here δ represents the minimal structural deviation. The dynamical zero is therefore a boundary between undifferentiated symmetry and the emergence of a wave state.

6. From 0′ to Wave

The transition from the dynamical zero to a differentiated wave is represented by an unfolding operation:

$$w = f(0')$$

The function f represents the generative transformation by which the latent distinction becomes an organized dynamic state. The wave is therefore not inserted as a primitive object; it is the realized form of an unfolding process.

7. Chirality and Direction of Unfolding

The unfolding may possess orientation. In FWA this is represented by chirality, which distinguishes alternative directions or handedness of the dynamic organization.

$$\chi = \text{orientation of unfolding}$$

Chirality is therefore treated as a structural property of the process rather than as an independently added label.

8. Ontological Result

The information layer establishes the first transition in the FWA hierarchy. Information is defined relative to symmetry; Lu represents the minimal gap of realization; the dynamical zero 0′ represents a generative transition; and the wave is the resulting differentiated process.

$$S \rightarrow Lu \rightarrow I \rightarrow 0' \rightarrow w$$

This page defines the information and symmetry layer that precedes the field, resonance, matter, interaction and observable layers developed in subsequent pages.