

## PAPER 21

# Load as the Cause of Structural Changes: The Relationship Between Time, Space, Gravity, and Center

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### Abstract

All experimental observations in physics consistently show that no structure exists without time, space, gravity, and center. These elements appear together in all confirmed cases, without known exceptions. Modern physics treats them as separate components of description but does not explain why they are inseparable. This paper proposes a model in which time, space, and gravity are functions of the central source of the system ( $C_0$ ), whereby the center becomes a necessary condition for the existence of any structure.

**Keywords:** time, space, gravity, center, structure, duration,  $C_0$ , function of center

### 1. Introduction

All experimentally confirmed observations in physics, astrophysics, and material sciences consistently show the following empirical facts.

There is no confirmed structure — particle, object, or process — that lacks spacetime, gravity, and center. Every observed structure possesses spatial relation and temporal duration, without known exceptions. Likewise, there is no confirmed structure that does not participate in gravitational relation; gravity acts on all forms of mass and energy in all observed systems.

Additionally, there is no confirmed particle or object without a center in the minimal physical sense. Center appears in observations as center of mass, center of interaction, centroid of localization, or nucleus around which the structure is organized. In all confirmed cases, structure is spatially organized as a range from center to edge, and there is no observed structure without such a range.

From the above, it follows that in all empirically confirmed structures, center, space, time, and gravity appear together, without observed exceptions. None of these elements has been confirmed as independent, nor has any been observed separately from the others.

Although space, time, gravity, and center are universally present in all confirmed structures, modern physics typically treats them as separate components of formal description: space and time as the framework of events, and gravity as an interaction. This reliably describes the behavior of structures but does not consider why space, time, gravity, and center are necessary and inseparable conditions for the existence of any structure.

This paper proceeds exclusively from these empirically confirmed facts and, based on proven measurements, derives a model in which space, time, and gravity are considered functions of the central source of the system, designated as  $C_0$ . In the proposed model, the center enables

the emergence of spatial range, temporal duration, and gravitational relation, thereby making possible the formation and maintenance of stable structure.

The proposed relationship can be expressed concisely as:

$$C_0 \rightarrow (\mathbf{x}, t, \mathbf{G}) \rightarrow \mathbf{S} \rightarrow C_0$$

where  $C_0$  is the center of the system,  $x$  is space (range),  $t$  is time (duration),  $G$  is gravity, and  $S$  is structure. The final  $C_0$  denotes the return of structure to the center from which it originated. The model does not question any known empirical fact, nor does it introduce new observational entities, but offers a functional explanation of the universal connection between center, space, time, and gravity as conditions for the existence of structure.

## 2. Empirical Basis

This section documents empirical evidence for each claim from the introduction, using exclusively confirmed measurements and observations from relevant scientific institutions.

### 2.1. No Structure Exists Without Time

In quantum field theory, particles are excitations of fields that evolve in time. Every particle has a characteristic lifetime — from stable (proton:  $>10^{34}$  years) to unstable (muon: 2.2 microseconds). Even virtual particles have a temporal quantitative description.

CERN confirmed through measurement of muon time dilation that particles in motion have extended lifetimes in accordance with the theory of relativity (Bailey et al., 1977). The photon, although having proper time equal to zero, travels through time in the observer's frame and participates in processes with temporal evolution.

**Conclusion:** No particle exists outside of time. Every known process has duration.

### 2.2. No Structure Exists Without Space

Every particle has spatial localization, whether as a point particle (electron, quark) or as a spatially extended object (hadron, atom, molecule). Heisenberg's uncertainty principle defines minimal spatial uncertainty but does not abolish spatiality.

All macroscopic structures — from atoms to galaxies — possess spatial extension. No observed structure exists without spatial dimension.

**Conclusion:** Every confirmed structure has spatial relation.

### 2.3. Gravity Acts on Everything

According to general relativity, gravity is not a force but the curvature of spacetime caused by the distribution of energy and momentum. Everything that has mass or energy participates in gravitational relation.

NASA confirms: "Gravity affects everything, everywhere" (NASA Cosmicopia). Even photons without rest mass respond to gravity — gravitational bending of light has been confirmed by observations during solar eclipses and measurements of gravitational lenses.

**Conclusion:** No known particle or object exists that does not participate in gravity.

## 2.4. No Structure Exists Without Center

In physics, center appears under different names depending on scale and discipline:

- In mechanics: center of mass
- In atomic physics: atomic nucleus
- In biology: cell nucleus
- In astrophysics: galactic center, stellar core
- In general relativity: source of spacetime curvature
- In quantum field theory: local field excitation

Mathematically, every continuous bounded body in Euclidean space has a centroid — a point of minimal average distance from all other points. This is a mathematical theorem, not a hypothesis.

**Conclusion:** All observed structures possess a center in one of the above forms. No confirmed structure exists without a center.

## 2.5. No Structure Exists Without Center-Edge Range

All observed structures are organized as a range from center to periphery:

- Atom: nucleus → electron cloud
- Cell: nucleus → membrane
- Planet: core → surface → atmosphere
- Star: core → photosphere → corona
- Galaxy: center → spiral arms → halo

No observed structure grows from periphery toward center. All known processes of structure formation begin from the center.

**Conclusion:** Radial organization center → edge is a universal characteristic of all known structures.

### 3. Synthesis of Empirical Facts

Reviewing the empirical evidence from section 2, the following can be concluded:

**Fact 1:** Every observed structure has time (duration).

**Fact 2:** Every observed structure has space (range).

**Fact 3:** Every observed structure participates in gravity.

**Fact 4:** Every observed structure has a center.

**Fact 5:** These elements appear TOGETHER in all confirmed cases.

No case has been confirmed in which:

- Structure exists without time
- Structure exists without space
- Structure exists without gravity
- Structure exists without center
- Time exists without structure
- Space exists without structure
- Gravity exists without structure

**Key question:** Modern physics describes the behavior of these elements but does not explain why they are inseparable. Why do time, space, gravity, and center always appear together?

## 4. Load as the Cause of Structural Changes

### 4.1. Initial State

Every structure arises from an initial state that defines the fundamental parameters of the system. In biological systems, this is the zygote. In physical processes, it is nucleation or critical point. The initial state determines the basic configuration of the system — the amount of matter, spatial range, and temporal duration intended for that system.

### 4.2. Definition of Load

In this paper, non-functional load is defined as accumulated material that does not contribute to the maintenance or function of structure, but rather disrupts its fundamental parameters.

Load arises from the accumulation of non-functional material above the parameters set by the initial state. This non-functional material represents part of the system that is not intended by the fundamental configuration.

### 4.3. Load Limit

The size of the structure is not the determining factor. Every structure, regardless of absolute size, has its own load limit. Within the same species, individuals with greater non-functional load show different characteristics than individuals with less load, regardless of species size.

### 4.4. Impact of Non-Functional Load Accumulation

Accumulation of non-functional load affects three fundamental functions of structure: it reduces temporal duration of the system, limits spatial functionality, and disrupts gravitational relation with the center.

### 4.5. Examples of Organisms

Organisms such as the jellyfish (*Turritopsis dohrnii*) show the ability to return to the initial state, thereby removing accumulated non-functional load and restoring fundamental system parameters. Most structures lack this ability and accumulate non-functional load during their duration, which limits their life cycle.

### 4.6. Conclusion on Load

Load is the cause of structural changes because it determines the extent to which structure can maintain time, space, and gravitational relation within the limits set by the initial state.

### 4.7. Duration of Structure as a Function of Deviation from Initial State

The initial state of a structure defines the optimal parameters of its existence. Any deviation from that state, whether in the direction of excess or deficiency, leads to a shortening of the structure's duration. Duration is therefore a direct function of the degree of deviation from initial conditions.

### 4.8. Duration of Return as a Function of Decomposition

The complete cycle of structure can be expressed by the relation:

$$C_0 \rightarrow (\mathbf{x}, \mathbf{t}, \mathbf{G}) \rightarrow \mathbf{S} \rightarrow C_0$$

The return of structure toward the initial state includes the same four components: space, time, gravity, and center. The duration of the return process depends on the degree of decomposition of the structure.

An empirical example of such a process is a tidal disruption event (TDE), accompanied by the formation of relativistic jets, where the structure under the influence of gravity decomposes and returns toward the source.

#### **4.9. Self-Maintenance of Structure**

Structures that actively remove non-functional load maintain stability and extend duration. Examples of such systems include organisms like jellyfish, as well as planetary systems like Saturn, which through various mechanisms of redistribution and ejection of non-functional load maintain long-term stability.

Conversely, accumulation of non-functional load leads to accelerated movement toward the center, thereby shortening the duration of the structure.

#### **4.10. Empirical Observation: Density and Rotation of Earth**

Earth is the planet with the highest mean density in the Solar System ( $5.51 \text{ g/cm}^3$ ). According to satellite and atomic time measurements, since 2020 an acceleration of Earth's rotation has been recorded. On June 29, 2022, the shortest day since precise measurements began was recorded.

In the Solar System, a correlation has been observed between planetary density and position: denser planets are located closer to the center of the system. The causal mechanism of this correlation requires further investigation.

## 5. Model Implications

### 5.1. Inseparability of Space and Time

Space and time do not exist without each other. In all confirmed structures, they appear as a unified dimensional whole. There is no observed structure in which time is present without spatial relation, nor space without temporal duration. Space and time are structurally inseparable — they always appear together.

### 5.2. Gravity as Cohesive Bond

Gravity is the strongest bond between structure and its own center. It is responsible for cohesion and structural maintenance of system integrity. Gravitational relation connects structure with its own center and with centers of other structures, enabling stability and interaction at all scales.

### 5.3. Two Time Regimes Within Structure

Within every structure, two different time regimes exist. The first regime refers to the total duration of the structure — from formation to cessation — and represents the common time of the structure as a whole. The second regime refers to individual parts of the structure, each of which has its own duration and its own temporal dynamics. Time does not flow equally in all parts of the structure but differs depending on role, position, and relation to the center.

### 5.4. Definition of Space in the Model

Space is not an empty frame. Space is the range from center to the edge of structure periphery. Within that range, structure is organized so that each part possesses its own spacetime relation. Space and time are internal characteristics of structure, not an external frame in which it is located.

### 5.5. Conclusion of Implications

Center, gravity, and spacetime are mutually inseparable. Without their simultaneous presence, structure cannot form, maintain itself, or endure.

## 6. Conclusion

Empirical data consistently show that center, space, time, and gravity appear together in all confirmed structures. None of these elements has been observed independently or separately from the others.

### Summary of empirical facts:

- Everything arises in the same way: FACT
- Everything has an end: FACT
- Everything has time: FACT
- Everything has space: FACT
- Everything has gravity: FACT
- Everything has a center: FACT

**There is no confirmed counterexample.**

**Space, time, gravity, and center do not exist separately.**

These facts apply to all known processes and structures, regardless of their scale or complexity. Processes cited as possible counterexamples actually confirm the universality of the center:

- Phase transitions have a critical point
- Crystallization has nucleation
- Turbulence has a local perturbation
- Cosmological fluctuations have quantum perturbations

Each of these processes begins with an initial condition — a center — from which structure develops through space and time.

The proposed model:

$$\mathbf{C}_0 \rightarrow (\mathbf{x}, \mathbf{t}, \mathbf{G}) \rightarrow \mathbf{S} \rightarrow \mathbf{C}_0$$

offers a functional explanation of this universal connection: space, time, and gravity are functions of the center, and the center is the cause of existence of every structure.

The model does not introduce new entities or new measures but uses empirically confirmed facts to describe the relationship between time, space, gravity, and center in all observed structures.

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