

Incorrect Estimation of Distances

L'Architech (Gabriel Breton-Breault)

The universe that is observed is not necessarily the real universe: it is the universe filtered through the local metric, through internal dynamics, and through the apparent speed of light that is measured. If the directional speed C_v varies for the observer — while the internal speed C_0 remains constant for the photon — every cosmological distance becomes an interpretation rather than an absolute value.

In a dilated space, local time stretches, light appears to slow down, and distances seem shorter than they truly are. In a contracted space, local time compresses, light appears to accelerate, and distances seem longer. Thus, classical cosmology, founded on a strictly constant speed of light for all observers, produces measurements that do not reflect the directional structure of the universe.

Incorrect Estimation of Distances designates this fundamental error: the observed distance depends on the observer's metric, whereas the real distance depends on universal dynamics. This divergence opens the way to a directional correction of cosmology, where each measurement must be reevaluated according to the local variation of C_v , directional tension, and the fluid geometry of space-time.

Chapter 1 — The Constant and Variable C

1.1 — The Fundamental Duality of C

The speed of light, traditionally considered an absolute constant, reveals a more complex structure when observed within a directional framework. For the photon, C remains a universal constant, independent of the metric, temporal dilation, or spatial stretching. For the observer, immersed in a fluid and variable geometry, C becomes an apparent speed influenced by the local state of space-time.

This duality — internal constant for the photon, apparent variable for the observer — forms the cornerstone of directional physics.

1.2 — C_0 : The Photon's Internal Constant

The photon evolves within universal time, without undergoing the metric variations experienced by massive systems. Its internal dynamics, directional tension, and local frequency remain invariant. The photon's real speed is therefore:

$$C_0 = \text{“universal constant”}$$

This constant represents:

- internal directional tension,
- local dynamics,
- intrinsic frequency,
- structural invariance of the photon.

C_0 is the only truly stable speed in the universe.

1.3 — C_v : The Apparent Speed Measured by the Observer

The observer evolves within a metric capable of:

- dilating,
- contracting,
- stretching,
- curving,
- slowing proper time,
- modifying perceived distances.

In this context, the measured speed is no longer C_0 , but:

$$C_v = C_v(\text{metric})$$

C_v depends on:

- temporal dilation,
- spatial stretching,
- local directional dynamics,
- centrifugal tension of the system,
- the fluid geometry of space-time.

Thus, C_v may decrease or increase depending on the state of the local metric.

1.4 — Consequence: C Becomes a Directional Variable

When C varies for the observer, all equations that use it become dynamic. The energy equation:

$$E = mc^2$$

transforms into:

$$E = m(C_v) \cdot C_v^2$$

This system implies that:

- a dilated metric reduces C_v ,
- a contracted metric increases C_v ,
- increased directional dynamics raise C_v ,
- an increase in C_v raises effective mass,
- a higher effective mass increases energy.

The equation ceases to be static and becomes a living relation, dependent on local geometry.

1.5 — Cosmological Impact: Incorrect Estimation of Distances

If C varies for the observer, cosmological distances based on light become potentially incorrect. The observer computes:

$$D_{\text{observed}} = C_v \times t_{\text{observed}}$$

Whereas the real distance is:

$$D_{\text{real}} = C_0 \times t_{\text{universal}}$$

Thus:

- a C_v lower than C_0 produces an underestimation of distance,
- a C_v higher than C_0 produces an overestimation.

This divergence introduces a major directional correction in modern cosmology, where the local metric directly influences the perception of distances.

1.6 — Chapter Summary

This chapter establishes the true nature of C :

- C_0 : internal constant of the photon, universal, directional, stable.
- C_v : apparent speed measured by the observer, dependent on the metric.
- The speed of light is constant only within the photon's internal frame.

- For the observer, it becomes a directional variable.
- This variation leads to incorrect estimation of cosmological distances.
- The energy equation becomes dynamic and dependent on local geometry.

C is simultaneously a universal constant and a directional variable. This duality forms the foundation of directional physics.

Chapter 2 — The Mass of the Photon

2.1 — The Fundamental Question: Does the Photon Possess a Mass?

Classical physics defines the photon as a particle without rest mass. This definition relies on a condition that cannot be realized: **the photon can never be observed at rest**. Its nature imposes perpetual motion, constant frequency, and irreducible internal dynamics.

Within a directional framework, this impossibility becomes a major indicator. If the photon can never be immobilized, then its rest mass can never be measured or defined. This observation opens the way to a new interpretation: **the photon possesses an extremely small mass, but only while in motion**.

2.2 — The Directional Mass of the Photon

Photon mass is not a static mass. It is not classical inertial mass. It is not rest mass.

It constitutes a **directional mass**, defined by:

- the particle's internal tension,
- its local frequency,
- its directional dynamics,
- its internal rotation,
- the minimal geometric structure of the photon's core.

This mass is extremely small, yet real. It appears only when the photon is in motion — which is always the case.

Directional mass can be expressed as a function of internal dynamics:

$$m_{\gamma} = m_{\gamma}(\nu, C_{\nu})$$

where:

- ν represents the frequency,
- C_ν the apparent speed within the observer's metric.

2.3 — Phenomena That Require Photon Mass

Several physical observations make the existence of a mass — even a minuscule one — necessary:

Gravitational Deflection

The photon changes trajectory in a gravitational field. A deflection implies dynamic interaction, and therefore directional inertia.

Capture by a Black Hole

A black hole can capture a photon. Capture requires minimal inertia, and therefore an effective mass.

Trajectory Curvature in a Deformed Metric

Light follows the geometry of space-time. A curved trajectory implies an inertial response.

Energy Transport

The photon carries energy:

$$E = h\nu$$

All transported energy has a mass equivalence:

$$m = \frac{E}{c^2}$$

This equivalence becomes a real directional mass in a dynamic framework.

These phenomena converge toward one conclusion: **an extremely small mass is necessary to explain photon dynamics.**

2.4 — An Infinitesimal, Non-Measurable, but Real Mass

The directional mass of the photon is:

- infinitesimal,
- not directly measurable,
- always present,
- strictly linked to motion,

- dependent on the metric,
- dependent on frequency,
- dependent on directional tension.

It cannot be isolated, because the photon cannot be stopped. It cannot be measured, because any attempt modifies its dynamics. It cannot be extracted, because it exists only in motion.

Photon mass is therefore **dynamic mass**, not rest mass.

2.5 — Directional Consequence: $E = mc^2$ Becomes a Living Equation

If the photon possesses an infinitesimal mass in motion, then the energy equation becomes:

$$E = m_{\gamma}(C_v) \cdot C_v^2$$

This relation implies that:

- photon mass depends on internal dynamics,
- apparent speed depends on the metric,
- energy depends on the variation of C,
- physics becomes directional.

Photon mass ceases to be an abstract concept: it becomes a fundamental element of the universe's directional structure.

2.6 — Chapter Summary

This chapter establishes the foundations of directional photon mass:

- The photon can never be observed at rest.
- Its rest mass is therefore indeterminable.
- An infinitesimal mass appears when it is in motion.
- This mass is directional, dynamic, and frequency-dependent.
- Gravitational phenomena require an effective mass.
- The energy equation becomes dynamic when C varies.
- Photon mass becomes central to directional physics.

The photon possesses an infinitesimal mass in motion. This mass explains its deflection, gravitational capture, and internal dynamics.

Chapter 3 — Slowing of a Photon

3.1 — The Prerequisite: An Infinitesimal Photon Mass

If the photon possesses an infinitesimal directional mass while in motion, this mass becomes a dynamic parameter that reacts to extreme variations in the metric. In strongly curved space-time, the photon's internal directional tension encounters geometric resistance. This interaction produces a measurable effect: **the apparent slowing of the photon**.

This slowing is not a reduction of the internal speed C_0 , which remains constant for the photon, but a modification of the apparent speed C_v measured by the observer.

3.2 — Interaction Between Photon Mass and Extreme Gravity

When a photon passes through a region where gravity reaches extreme intensities — for example near a black hole, a neutron star, or a massive cluster — the local geometry imposes a deformation of the metric. This deformation affects the photon's trajectory, but also its directional dynamics.

A mass, even infinitesimal, reacts to the curvature of space-time. Thus, the photon:

- undergoes deflection,
- loses part of its directional energy,
- experiences a decrease in frequency,
- and exhibits apparent slowing.

This slowing is a direct consequence of the existence of directional mass.

3.3 — Apparent Slowing: A Variation of C_v

The photon's internal speed, C_0 , remains constant. However, the apparent speed measured by the observer, C_v , varies according to the local metric:

$$C_v = C_0(\text{gravity, dilation, geometry})$$

In a region of extreme gravity:

- the observer's proper time dilates,
- local space stretches,

- the photon's trajectory curves,
- frequency decreases,
- directional dynamics compress.

These combined effects produce the photon's apparent slowing.

3.4 — Directional Slowing: A Consequence of Mass

If the photon possesses an infinitesimal mass, then its internal dynamics respond to gravity like any directional structure. The photon's internal tension encounters geometric resistance, leading to:

- a decrease in frequency,
- an increase in internal time,
- a reduction in apparent speed,
- a modification of transported energy.

This slowing is not a violation of the constancy of C_0 . It is a directional variation of C_v , linked to the local metric.

3.5 — Slowing and Energy: A Directional Relationship

The photon carries energy:

$$E = h\nu$$

If frequency decreases in a region of extreme gravity, then the transported energy also decreases. This reduction in energy translates into increased directional inertia, reinforcing the apparent slowing.

Thus, photon slowing is a direct consequence of:

- its directional mass,
- the decrease in frequency,
- metric deformation,
- local gravitational tension.

3.6 — Chapter Summary

This chapter establishes the foundations of directional photon slowing:

- An infinitesimal mass in motion implies directional inertia.
- Extreme gravity imposes metric deformation.
- The photon responds with a decrease in frequency.
- The internal speed C_0 remains constant.
- The apparent speed C_v decreases according to the local metric.
- Slowing is a direct consequence of directional photon mass.
- This phenomenon explains deflection, capture, and energy loss in extreme gravitational regions.

A photon possessing an infinitesimal mass slows when traversing extreme gravity. This slowing is directional, metric-dependent, and dynamic.

Chapter 4 — C: Constant in a Stable Environment, Variable in an Extreme Environment

4.1 — The Stability of C in a Constant Environment

In a region of the universe where the metric remains stable, where gravity is weak or moderate, and where space-time shows no significant deformation, the apparent speed of light remains equal to its internal value. In this context, the directional speed of the photon is perceived as a constant:

$$C_v = C_0$$

This equality reflects a state of equilibrium between:

- the photon's internal directional tension,
- the local geometry of space-time,
- the transported frequency,
- the propagation dynamics.

In a constant environment, light travels through space without encountering metric resistance. The apparent speed remains stable, allowing C to be used as a constant in classical physical equations.

4.2 — The Breakdown of Constancy in an Extreme Environment

When the photon enters a region where gravity reaches extreme intensities, the local metric deforms. This deformation directly affects the photon's directional dynamics, which possesses an infinitesimal mass in motion.

In such an environment:

- proper time dilates,
- local space stretches,
- the trajectory curves,
- frequency decreases,
- transported energy changes.

These combined effects produce an apparent slowing of light:

$$C_v < C_0$$

The photon's internal speed C_0 remains constant. However, the apparent speed measured by the observer, C_v , becomes a variable dependent on local geometry.

4.3 — Directional Slowing of the Photon

The slowing of the photon in an extreme environment is a direct consequence of its infinitesimal directional mass. This mass reacts to the curvature of space-time, resulting in:

- a decrease in frequency,
- an increase in internal time,
- a reduction in apparent speed,
- a loss of directional energy.

The photon does not slow down in its internal frame: it slows down in the observer's frame, whose metric is deformed.

Thus, the apparent speed becomes a function of gravity:

$$C_v = C_v(\text{gravity})$$

4.4 — C: Universal Constant, Directional Variable

Directional physics establishes a fundamental distinction:

C_0 : Photon's Internal Constant

Always identical. Always stable. Always directional.

C_v : Apparent Speed Measured by the Observer

Variable. Metric-dependent. Influenced by extreme gravity.

In a constant environment:

$$C_v = C_0$$

In an extreme environment:

$$C_v < C_0$$

This duality transforms the speed of light into a directional quantity dependent on the local state of space-time.

4.5 — Cosmological Consequence: Variation of C and Measurement Errors

If C becomes variable in extreme environments, cosmological distances based on light may be distorted. Light takes more time to cross a dilated region, modifying the apparent speed and causing errors in distance estimation.

Thus, the directional variation of C becomes essential for correcting:

- distances of distant galaxies,
- gravitational lensing measurements,
- light trajectories in massive clusters,
- observations of the cosmic background.

4.6 — Chapter Summary

This chapter establishes the foundations of directional variation of C:

- In a constant environment, C is perceived as constant.
- In an extreme environment, C becomes a directional variable.
- The photon slows when crossing extreme gravity.
- This slowing is apparent and metric-dependent.
- The internal speed C_0 remains constant.
- The apparent speed C_v decreases according to gravity.
- Variation of C leads to errors in cosmological distance estimation.

C is constant in a stable environment but variable in an extreme one. This directional variation is a fundamental property of the photon's dynamic physics.

Chapter 5 — The Error in Distance Estimation

5.1 — The Dependence of Distance on the Speed of Light

In classical cosmology, the distance of a distant object is estimated from the time light takes to reach the observer. This estimation relies on a simple relation:

$$D = C \times t$$

where:

- D is distance,
- C is the speed of light,
- t is travel time.

This relation assumes that C is strictly constant throughout the universe, regardless of local metric or gravity.

However, previous chapters established that:

- the photon's internal speed C_0 remains constant,
- but the apparent speed C_v depends on the local metric.

Thus, the classical relation becomes insufficient in a directional framework.

5.2 — Variation of C_v in Extreme Environments

When the photon crosses a region of extreme gravity, the local metric dilates. This dilation causes:

- apparent slowing of the photon,
- decreased frequency,
- modified transported energy,
- increased travel time.

In this context:

$$C_v < C_0$$

The apparent speed becomes a directional variable dependent on local geometry:

$$C_v = C_v(\text{metric})$$

This variation directly alters distance estimation.

5.3 — Observed Distance vs. Real Distance

The observer measures distance using apparent speed:

$$D_{\text{observed}} = C_v \times t_{\text{observed}}$$

However, the real distance depends on the photon's internal speed:

$$D_{\text{real}} = C_0 \times t_{\text{universal}}$$

These distances are equal only if the metric is perfectly stable. In an extreme environment, they diverge.

5.4 — Underestimation and Overestimation of Distances

Two cases arise:

1 — Underestimation

If the metric is dilated, the photon appears to slow:

$$C_v < C_0$$

$$D_{\text{observed}} < D_{\text{real}}$$

Objects appear closer than they truly are.

2 — Overestimation

In certain contracted geometries, apparent speed may increase:

$$C_v > C_0$$

$$D_{\text{observed}} > D_{\text{real}}$$

Objects appear farther than they truly are.

5.5 — Major Cosmological Consequences

Distance-estimation errors affect:

- measurements of distant galaxies,
- quasar distances,
- light trajectories in massive clusters,

- gravitational lensing,
- expansion-rate calculations,
- cosmic background observations,
- large-scale structure models.

If C_v varies in certain regions of the universe, part of modern cosmology rests on potentially distorted distances.

Directional correction becomes essential to reevaluate:

- the real size of the observable universe,
- expansion speed,
- mass distribution,
- global geometry of space-time.

5.6 — Chapter Summary

This chapter establishes the foundations of distance-estimation error:

- Cosmological distance depends on the speed of light.
- Internal speed C_0 is constant, but apparent speed C_v is variable.
- In extreme metrics, the photon slows.
- Observed distance differs from real distance.
- Dilated metrics produce underestimation.
- Contracted metrics produce overestimation.
- Cosmological distances can be distorted in extreme environments.
- This directional correction profoundly alters modern cosmology.

Distance-estimation error is a direct consequence of directional variation of C. It redefines how the universe is measured, interpreted, and understood.

Chapter 6 — The Variable C in $E = Mc^2$

6.1 — The Classical Equation: A Static Relation

In classical physics, the energy equation:

$$E = mc^2$$

is treated as a fixed relation, where:

- m represents rest mass,
- c is an absolute constant,
- E is total energy.

This formulation relies on two assumptions:

1. Mass is a static quantity.
2. The speed of light is strictly constant for all observers.

Within a directional framework, both assumptions cease to be valid.

6.2 — Conceptual Break: C Becomes a Directional Variable

Previous chapters established that:

- the photon's internal speed C_0 remains constant,
- but the apparent speed C_v varies according to the local metric.

Thus, the classical equation cannot be applied unchanged. The speed of light becomes a directional quantity:

$$C = C_v(\text{metric})$$

This variation transforms the energy equation into a dynamic relation.

6.3 — Directional Mass Depends on C

The photon's mass is not rest mass. It is a **directional mass**, defined by:

$$m_\gamma = m_\gamma(\nu, C_v)$$

where:

- ν is the frequency,
- C_v is the apparent speed within the observer's metric.

Thus, when C_v varies:

- frequency varies,
- energy varies,
- directional mass varies.

The photon's mass becomes a function of its apparent speed.

6.4 — The Directional Energy Equation

The classical equation:

$$E = mc^2$$

becomes, in a directional framework:

$$E = m_\gamma(C_v) \cdot C_v^2$$

This formulation implies:

- energy depends on directional mass,
- directional mass depends on apparent speed,
- apparent speed depends on the local metric.

Thus, **E becomes a dynamic quantity**, sensitive to the geometry of space-time.

6.5 — Consequence: Coupled Variation of C, M, and E

When the metric dilates or contracts, the photon's apparent speed changes:

- extreme gravity slows the photon $\rightarrow C_v$ decreases,
- contracted metrics accelerate it $\rightarrow C_v$ increases.

This variation produces:

Variation of Directional Mass

$$m_\gamma = m_\gamma(C_v)$$

Variation of Transported Energy

$$E = m_\gamma(C_v) \cdot C_v^2$$

Variation of Directional Dynamics

- modified frequency,

- modified directional inertia,
- modified trajectory.

Directional physics establishes a dependency chain:

$$C_v \Rightarrow m_\gamma \Rightarrow E$$

Variation of C produces variation of M, which produces variation of E.

6.6 — Cosmological Impact: Non-Constant Energy

If the apparent speed of light varies in certain regions of the universe, then:

- photon energy is not constant,
- directional mass is not constant,
- measurements based on luminous energy become sensitive to the local metric.

This affects:

- spectral measurements,
- redshift interpretation,
- distance estimation,
- expansion-rate models.

The equation $E = mc^2$ ceases to be universal: it becomes **local**, dependent on gravitational environment.

6.7 — Chapter Summary

This chapter establishes the foundations of variable C in the energy equation:

- The classical equation assumes constant light speed.
- In a directional framework, C becomes an apparent variable.
- Photon mass depends on C.
- Energy depends on directional mass and C.
- $E = mc^2$ becomes dynamic.
- Variation of C produces variation of M and E.
- Photon energy becomes sensitive to space-time geometry.

$E = mc^2$ is not a static equation: it is a directional, living equation, dependent on the metric and the photon's dynamics.

General Conclusion

The collection of chapters establishes a coherent, directional, and dynamic structure for the physics of the photon and the speed of light. This model rests on a central idea: quantities considered absolute in classical physics become directional quantities when placed within the fluid geometry of space-time.

1 — C: Internal Constant, Apparent Variable

The speed of light possesses a dual nature:

- C_0 — the photon's internal constant, stable, universal, and independent of the metric.
- C_v — the apparent speed measured by the observer, dependent on gravity, temporal dilation, and spatial deformation.

This duality transforms C into a directional quantity capable of varying in extreme environments.

2 — The Photon Possesses an Infinitesimal Directional Mass

The photon can never be observed at rest. Its rest mass is therefore indeterminable. However, several phenomena require a dynamic mass:

- gravitational deflection,
- capture by a black hole,
- energy transport,
- inertial response to the metric.

This mass is infinitesimal, not directly measurable, but real in motion.

3 — Apparent Slowing in Extreme Environments

The photon's directional mass reacts to gravitational geometry. In a region of extreme gravity:

- frequency decreases,
- transported energy changes,

- trajectory curves,
- apparent speed C_v decreases.

The photon does not slow in its internal frame, but in the observer's frame, whose metric is deformed.

4 — The Error in Distance Estimation

If C_v varies, then cosmological distances based on light become potentially distorted. Observed distance depends on apparent speed, while real distance depends on internal speed.

Thus:

- a dilated metric produces **underestimation**,
- a contracted metric produces **overestimation**.

This directional correction profoundly alters the understanding of the observable universe.

5 — A Coherent Directional Physics

The chapters form a logical whole:

- C is not strictly constant.
- The photon possesses an infinitesimal mass in motion.
- Extreme gravity slows the apparent speed of light.
- Cosmological distances can be distorted.
- Cosmology must integrate the directional variation of C .

This model proposes a more dynamic, more geometric, and more realistic vision of the universe, where every quantity depends on the local metric and directional tension.

Final Conclusion

Directional physics reveals a universe where light is not an absolute invariant, but a dynamic structure sensitive to the geometry of space-time. This sensitivity redefines the photon's mass, its apparent speed, its gravitational interaction, and the way cosmological distances are measured.