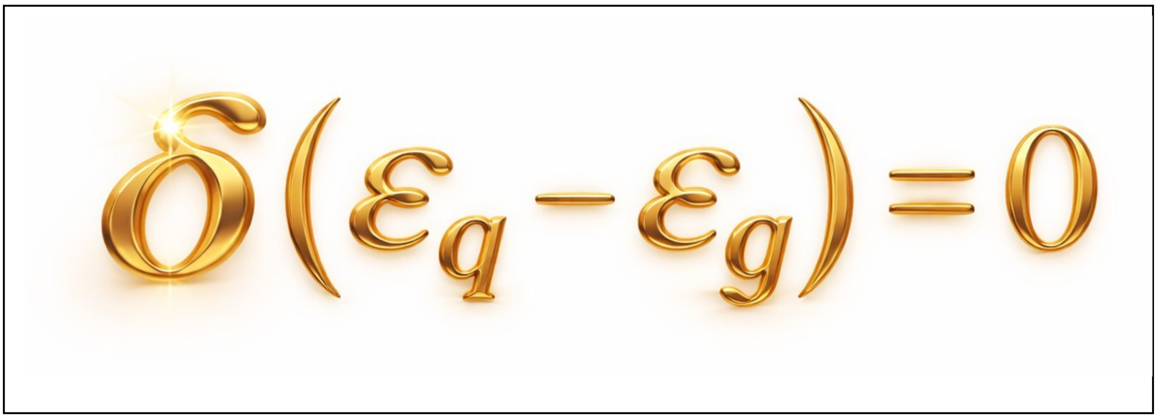
$\delta(\varepsilon_q - \varepsilon_g) = 0$


α

Introduction α of Correlational Disequilibrium and Correlated Bubble-Cosmos Hypothesis (HDC-CBC/α)

Documentos complementarios de la Hipótesis:

Hipótesis del Desequilibrio Correlacional (HDC–CBC)
Primera Parte — Marco clásico, geométrico y cosmológico
Zenodo: **https://doi.org/10.5281/zenodo.17559051**

eXtensión cuántica del Desequilibrio Correlacional (HDC–CBC/Q)
Segunda Parte — Marco Cuántico
https://doi.org/10.5281/zenodo.17683173

eXtensión relativista del Desequilibrio Correlacional (HDC–CBC/R)
Tercera Parte — Marco Relativista
https://doi.org/10.5281/zenodo.17762262

Módulo Perturbativo del Desequilibrio Correlacional (HDC–CBC/P)
Cuarta Parte — Perturbaciones
https://doi.org/10.5281/zenodo.17839095

eXtensión Tensorial del Desequilibrio Correlacional (HDC-CBC/T)
Quinta Parte — Tensoriales
https://doi.org/10.5281/zenodo.17987410

Módulo Observacional del Desequilibrio Correlacional (HDC-CBC/O)
sexta Parte — Predicciones Observacionales

https://doi.org/10.5281/zenodo.18000439

Módulo Numérico del Desequilibrio Correlacional (HDC-CBC/N)
séptima Parte — Numérico

https://doi.org/10.5281/zenodo.18068474

Síntesis Ω del Desequilibrio Correlacional (HDC-CBC/ Ω)
Octava Parte — Síntesis

https://doi.org/10.5281/zenodo.18138687

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Preface of α

This document, **HDC–CBC/α**, occupies a particular position within the set of works that make up the **Hypothesis of Correlational Disequilibrium and the Correlated Bubble Cosmos (HDC–CBC)**.

Although it is the last volume to be written, it has been deliberately conceived as the first one to be read.

This inversion of order is neither accidental nor merely editorial. It reflects, in a coherent manner, the internal logic of the hypothesis itself: a framework that proposes that observable reality emerges from a process of progressive decorrelation, in which the conceptual origin does not necessarily coincide with the later technical development. In this sense, **Alpha** functions as the most accessible level of the system, from which the whole can be understood.

The main objective of this volume is to serve as an effective entry point to the physical and conceptual foundations of the HDC–CBC hypothesis. It is written with readers in mind who are not necessarily specialized in relativistic cosmology, quantum field theory, or mathematical physics, but who are interested in understanding the underlying problems that traverse contemporary cosmology.

HDC–CBC/α does not aim to formally demonstrate the model or to present technical results. Nor does it seek to replace existing frameworks. It is explicitly presented as a new proposal, motivated by current tensions in cosmology, and offered to be analyzed, discussed, criticized, and, if deemed appropriate, taken into consideration.

Motivation

Modern cosmology has reached an extraordinary level of observational precision. However, this success coexists with a growing accumulation of conceptual and empirical tensions: persistent discrepancies in the Hubble constant, deviations in structure growth, difficulties in interpreting the nature of dark energy and dark matter, and the persistence of an initial singularity lacking a consensual physical interpretation.

These tensions are not presented here as errors or failures of the standard model, but as symptoms of a possible conceptual limit. **Alpha** arises from the question of whether these difficulties might be indicating that certain fundamental elements of current cosmology are effective descriptions, rather than ultimate ingredients of reality.

Scope of Volume α

This volume has been written with deliberate constraints:

- It does not develop advanced mathematical formalism.
- It does not introduce technical derivations or numerical results.
- It uses a single formal expression, which acts as the central physical principle.
- It prioritizes conceptual understanding over technical rigor.

The entire text is written in accessible language and with a propositional tone. At no point is it claimed that the hypothesis is correct; it is presented as a physical possibility that deserves examination.

The complete technical developments of the HDC–CBC framework are found in the subsequent volumes:

- **HDC–CBC** (Base Document)
- **Q** (quantum extension),
- **R** (relativistic formulation),
- **P** (perturbative module),
- **T** (tensorial extension),
- **O** (observational module),
- **N** (numerical module),
- as well as **Volume Ω**, which acts as the global synthesis of the framework, and also functions as the **CBC_t extension**.

For readers with advanced training, direct reading of these volumes is recommended. For non-specialized readers, the suggested path is:

HDC–CBC/α → HDC–CBC (base document) → Ω

Note to the Reader

During the reading of this volume, the reader is explicitly invited to carry out a specific intellectual exercise:
to attempt, for a few moments, to detach from a strictly relativistic mindset.

This does not imply rejecting General Relativity or questioning its empirical validity, but rather provisionally accepting the possibility that geometry, time, and causality may not be the most fundamental elements of physical reality, but emergent structures.

The concepts introduced in this volume — **Greater Cosmos, correlational disequilibrium, emergence of time and geometry** — should be understood as conceptual tools, not as closed assertions. The reader is not called upon to accept them, but to evaluate whether they constitute a coherent way of reorganizing the current problems of cosmology.

Nature of the Proposal

All the content of **HDC–CBC/α** must be read under a constant premise:
this document does not assert, it proposes.

The hypothesis is presented as a possible interpretative route for current tensions in cosmology and for the fundamental definitions of theoretical physics. Its value, if any, will depend on its internal coherence, its explanatory capacity, and its future confrontation with data and with other theoretical frameworks.

With this spirit, this volume is offered: **as an introduction, not as a conclusion**.

GENERAL INDEX α

Introduction α of Correlational Disequilibrium and Correlated Bubble-Cosmos Hypothesis (HDC-CBC/α)

Por Jordi Audet Palau (Barcelona January the 10th of 2026)

"Imagination is more important than knowledge. For knowledge is limited, whereas imagination embraces the entire world, stimulating progress and giving birth to evolution."

Albert Einstein

Chapter 1

A different starting point for thinking about the universe

Modern cosmology is, without doubt, one of the most successful intellectual constructions of contemporary physics. With a relatively small set of hypotheses, it has managed to describe with great precision the expansion of the universe, the formation of structures, the cosmic microwave background, and a wide variety of independent observables. From an operational point of view, the standard model works remarkably well.

However, this descriptive success coexists with a conceptually uncomfortable situation. A substantial part of the content of the universe is attributed to entities whose physical nature remains unknown. Dark energy and dark matter dominate the cosmological budget, yet they have not been directly identified nor naturally integrated into a deeper theoretical framework. At the same time, the origin of the universe continues to be associated with an initial singularity whose physical interpretation is, at the very least, problematic.

These difficulties do not invalidate the standard model, but they do invite a broader reflection: it is possible that current cosmology correctly describes the behavior of the observable universe, but does so at an effective, not fundamental, level. In other words, it may be capturing the effects very well, without having yet identified the ultimate cause that articulates them.

From this perspective, recent cosmological tensions — such as persistent discrepancies in the Hubble constant or in structure growth — acquire a different meaning. Rather than technical anomalies or simple experimental errors, they could be interpreted as signals that the conceptual framework used to read the data is reaching its limits.

This work arises from that concern.

It does not propose to correct the standard model through local adjustments nor to introduce new ingredients in an ad hoc manner. Nor does it seek to compete with ΛCDM on its operational ground. The motivation is more basic: to explore whether some of the concepts that are today taken as fundamental — space, time, geometry, energy, causality — might in fact be emergent, and whether that emergence could be related to a deeper physical process that has not yet been explicitly formulated.

In order to pose this possibility, it is necessary to take a small step back and question something that is rarely questioned in cosmology: the primacy of geometry as a starting point. Since General Relativity, space-time has become the fundamental stage of physical reality. Everything occurs within it; everything is explained through it. Even when one speaks of quantum fields, they are defined over a prior geometric structure.

But it is not evident that this hierarchy is inevitable.

One may ask whether geometry is truly the deepest level of description, or whether it could be the macroscopic manifestation of something prior. This question does not arise from philosophical dissatisfaction, but from the accumulation of physical indications: the difficulty of unifying gravity and quantum mechanics, the problematic nature of singularities, the emergence of time in certain quantum approaches, and the very structure of the vacuum.

The HDC–CBC hypothesis situates itself at this exact point. It proposes to consider that the observable universe does not arise from an initial geometry, but from a prior physical state, highly correlated, in which notions such as space and time would not yet be defined in the usual sense. The universe we observe would be a region in which that state has lost part of its coherence, progressively giving rise to structure, dynamics, and causality.

To refer to this prior state, the term **Greater Cosmos** is introduced. It is not another universe, nor an additional space, nor a hidden dimension. It is simply a way of naming a limiting physical regime, necessary to think about the origin without presupposing precisely what one is trying to explain.

From this point of view, the observable universe could be understood as a bubble: not in a spatial sense, but a relational one. A region where correlation ceases to be perfect and where, as a consequence, internal differences appear that are capable of sustaining geometry, time, and evolution.

This change of perspective has profound implications. If geometry emerges, so does time. If time emerges, causality ceases to be an axiom and becomes a consequence. If both emerge, then concepts such as dark energy, dark matter, or the initial singularity may require a deeper reinterpretation.

None of this is presented here as an established assertion. It is a conceptual proposal, motivated by current tensions and offered as an alternative framework of interpretation. Its value does not lie in replacing existing theories, but in opening a space in which certain questions can be formulated in a different way.

Although this volume does not develop quantitative predictions nor direct adjustments to observational data, it is worth noting that the HDC–CBC framework is not merely speculative. Its formulation is designed to engage with well-established cosmological observables — such as the effective Hubble constant, structure growth, or the evolution of the gravitational potential — not through the introduction of new fields or ad hoc parameters, but through a conceptual reorganization of the foundations on which those observables are interpreted. In subsequent volumes, it will be shown how this reorganization allows certain current tensions to be reread without altering the dynamic core of standard models.

The following chapters develop this idea progressively. First, the concept of correlational disequilibrium is introduced as a possible physical driver. Then it is explored how, from that point of view, dark energy, dark matter, geometry, black holes, time, and finally current cosmological tensions might be reinterpreted.

The aim is not to close the debate, but to initiate it from a different place.

Chapter 2

Correlational disequilibrium as a fundamental physical principle

If the observable universe is not taken as the ultimate point of departure, but rather as the result of a deeper process, it becomes necessary to introduce a physical principle capable of describing that transition. Not a detailed mechanism nor a technical equation, but an organizing idea that allows one to think about the passage from a highly correlated basal state toward a universe with geometry, time, and dynamics.

The HDC–CBC hypothesis proposes that this principle can be formulated in a surprisingly simple way: the universe would tend to organize itself such that the disequilibrium between two fundamental forms of energy — that associated with the basal quantum state and that associated with emergent geometry — does not grow arbitrarily but remains dynamically compensated.

This idea is summarized in a single expression, which should not be understood as an equation to be solved, but as a global physical criterion:

$$\delta(\varepsilon_q - \varepsilon_g) = 0$$

In this expression, equality should not be understood as a trivial algebraic identity, but as a structural criterion: the condition under which a geometric domain can sustain a coherent dynamics. As long as the difference between the quantum and geometric correlational densities remains stationary, the notions of time, causality, and evolution retain operational meaning. The breakdown of this condition does not describe a local physical event, but rather the conceptual limit beyond which such notions cease to be applicable. In this sense, the equation acts as an organizing principle of the HDC–CBC framework, rather than as a dynamical law in the classical sense.

Presented in this way, the formula does not aim to describe a local calculation nor a fine-tuned adjustment. Its meaning is conceptual. It suggests that the universe evolves according to a principle of dynamic equilibrium between two opposing tendencies: on the one hand, the energy associated with the quantum coherence of the basal state; on the other, the energy associated with the emergence of geometric structure.

Two types of energy, two levels of description

To understand the scope of this principle, it is useful to momentarily detach from the usual notion of energy as something exclusively linked to particles, fields, or motion. In this context, energy is understood in a broader sense, as a measure of the physical state of the system.

Basal quantum energy does not refer to particles or localized excitations. It represents the degree of coherence of the deep state of the system, a state in which spatial and temporal distinctions are not yet defined. This energy does not drive processes in the classical sense; it characterizes a highly correlated and stable regime.

Geometric energy, by contrast, appears when the system begins to differentiate internally. It is associated with curvature, expansion, and the emergence of spatial and temporal relations. It does not exist prior to the existence of geometry; it emerges together with it.

The principle of correlational disequilibrium does not claim that one of these energies is more fundamental than the other. It proposes that the observable universe arises precisely from the tension between both.

The physical meaning of null variation

The condition of null variation should not be interpreted as a static equilibrium. It does not suggest that the two energies are equal nor that the system is at rest. On the contrary, it implies that the system can evolve, expand, and transform, but does so in such a way that the disequilibrium does not become uncontrolled.

In this sense, the expansion of the universe would not be the result of an external force nor of artificially added energy. It could be understood as the natural response of the system when quantum coherence is locally reduced, and geometry begins to take shape.

Cosmic acceleration, from this perspective, would not necessarily require an additional substance. It could arise as a direct consequence of the system's attempt to redistribute the disequilibrium between coherence and geometry as it evolves.

From principle to cosmological process

This principle allows the origin of the universe to be reinterpreted not as a singular event, but as a continuous process of transition. There would be no defined initial instant in time, because time itself emerges as part of the process.

As correlational disequilibrium becomes effective in a region, notions such as distance, duration, and causality gradually appear. The observable universe does not "begin" at a moment but rather acquires temporality as it organizes.

This reading makes it possible to address the cosmological origin without the need to postulate arbitrary initial conditions or real physical singularities. The singularity would be a mathematical extrapolation of a geometric description beyond its domain of validity, not a literal physical object.

A unifying principle, not a fitting equation

One of the main motivations of this approach is its ability to conceptually unify phenomena that are currently treated separately. Dark energy, dark matter, accelerated expansion, the relativity of time, and certain observational tensions could be understood as different manifestations of a single underlying principle.

This does not imply that all answers are contained in the central formula. It implies that there exists a common physical idea capable of organizing the whole without resorting to multiple independent hypotheses.

The value of the principle does not lie in its formal simplicity, but in its potential explanatory power.

Interpretative caution

It is important to emphasize that this principle is not presented as a demonstrated law. It is not claimed that the universe “obeys” this condition in a verifiable way across all regimes. It is proposed as a working hypothesis, motivated by the structure of the current cosmological problem.

Its acceptance or rejection does not depend on its conceptual elegance, but on its ability to generate coherent and, eventually, testable descriptions. The technical developments of the HDC–CBC framework explore precisely these consequences, but they are not necessary in order to understand the conceptual scope of the principle.

Toward physical consequences

Once this principle has been introduced, it becomes natural to ask what kind of universe could emerge from it. If geometry is a response to disequilibrium, how should dark energy and dark matter be reinterpreted? If time emerges, what does its relativity mean? If geometry has limits, how should black holes be understood?

These questions are not addressed as independent problems, but as different facets of a single central idea.

The next chapter will focus precisely on one of them: how dark energy and dark matter might be reinterpreted if they are considered not as fundamental entities, but as effective expressions of the correlational disequilibrium that gives rise to the observable universe.

Chapter 3

Dark energy and dark matter as effective descriptions of a single process

Once the principle of correlational disequilibrium has been introduced, it becomes natural to reconsider some of the most enigmatic elements of current cosmology. Among them stand out dark energy and dark matter, two components that dominate the energy content of the universe and that nevertheless still lack a direct physical identification.

Within the usual framework, both are treated as distinct entities: dark energy is associated with the acceleration of expansion, while dark matter is introduced to explain the gravitational dynamics of galaxies and clusters. This separation has proven extremely effective from a phenomenological point of view, but it has also fragmented cosmological discourse into apparently independent problems.

The approach proposed in this work invites the exploration of a different reading: that dark energy and dark matter do not represent two separate physical realities, but two manifestations of a single underlying process, observed in different regimes.

If geometry emerges as a response to an imbalance between quantum coherence and geometric structure, accelerated expansion could be understood as a global consequence of that dynamic adjustment. In that context, dark energy would cease to be a substance added to the universe and would instead become an effective description of the way in which the system redistributes disequilibrium at large scales.

This interpretation would help explain why dark energy appears so homogeneous and so weakly coupled to ordinary matter. It would not be associated with local excitations, but with the global state of the universe in its process of relaxation.

Dark matter, in turn, could be reinterpreted through a similar logic, but applied at smaller scales. Where visible matter introduces structure and breaks homogeneity, the geometric response of the system might not be exactly what is expected if one assumes a fundamental and immutable geometry. The observable result would be dynamics equivalent to the presence of additional mass, without this necessarily implying the existence of new particles.

From this perspective, dark matter is neither denied nor discarded, but its role is redefined. It could be an effective manifestation of how emergent geometry responds to the distribution of matter in a universe that has not yet reached a complete correlational equilibrium.

This reading offers a possible conceptual unification: at large scales, disequilibrium manifests as accelerated expansion; at the scale of structures, as an effective modification of the gravitational response. Two distinct phenomena, a single common root.

An interesting consequence of this unification is the reinterpretation of certain cosmological coincidences. The fact that dark energy and dark matter dominate the universe in the same cosmic epoch could cease to be a fine-tuning problem and become a natural consequence of a shared evolutionary process.

This idea does not eliminate the need to confront models with data, nor does it replace observational analysis. However, it suggests that some current tensions might arise precisely from treating them as independent entities what, at a deeper level, could be part of the same dynamics.

From this approach, small discrepancies between observables — such as those related to structure growth or gravitational lensing — could reflect differences in how correlational disequilibrium manifests in different contexts, rather than internal inconsistencies of the universe.

It is important to emphasize that this reinterpretation does not aim to offer an immediate or closed solution to the problems of dark energy and dark matter. Its value lies in reorganizing the problem, reducing the number of fundamental assumptions and opening the possibility that a single physical principle may explain phenomena that are currently treated separately.

In the following chapters, this same logic will be applied to other central elements of cosmology, such as the geometry of space-time, black holes, and the nature of time. The objective will not be to replace existing descriptions, but to explore whether they can be understood as emergent approximations of a deeper physical process.

Chapter 4

Space-time geometry as a result rather than a point of departure

One of the most deeply rooted ideas in modern physics is that the geometry of space-time constitutes the fundamental substrate of reality. Since General Relativity, gravity, the expansion of the universe, and causality have been described as primary geometric properties. Everything occurs within space-time, and everything must be formulated in its terms.

The approach developed in this work invites a reconsideration of that logical order. The empirical validity of geometric description is not questioned, but rather its ontological status. There is the possibility that geometry is not the ultimate origin, but a macroscopic consequence of a deeper physical process associated with correlational disequilibrium.

If the observable universe emerges from a highly correlated basal state, the appearance of geometry could be understood as the way in which the system internally organizes the loss of coherence. In a fully correlated state, notions of distance and extension would lack physical meaning. Only when the system begins to differentiate internally can stable spatial relations arise.

From this perspective, space would not be a prior stage on which physical processes occur, but a relational structure that appears when the system needs to encode internal differences in a consistent way. Geometry does not precede dynamics; it is born together with it.

This conceptual inversion allows for a reinterpretation of space-time curvature. Rather than being the primary cause of gravitational motion, curvature could be understood as the geometric response of the system to a given state of disequilibrium. Matter and energy do not “curve” a preexisting space; rather, emergent geometry adopts a specific form depending on the degree and distribution of correlational disequilibrium.

Under this reading, General Relativity would retain all of its descriptive power but would acquire a different meaning. Its equations would not be fundamental laws of the universe in the ultimate sense, but effective laws that describe with enormous precision the behavior of geometry once it has emerged and stabilized.

This could help explain why General Relativity works so well across an extremely wide range of scales and, at the same time, why it encounters conceptual difficulties in extreme regimes, such as cosmological singularities or the interior of black holes. In those limits, geometry may be being pushed beyond the domain in which it is an adequate description.

The joint emergence of space and time is especially significant. If geometry appears as a relational structure, time cannot be an independent dimension that exists beforehand. Both would arise as inseparable aspects of the same process: the progressive organization of disequilibrium.

This would offer a natural reading of the relativity of time. Time dilation would not be a mysterious property of the universe, but a direct consequence of the fact that time is not absolute, but contextual, dependent on the geometric and dynamical state of the system in which it is measured.

From this point of view, causality would not be a principle imposed from outside either. Cause–effect relations would emerge together with geometry and time, as a stable structure that allows physical processes to be ordered once the universe has acquired sufficient internal differentiation.

This reinterpretation does not eliminate observed causality nor known geometry. It simply suggests that both may have a common origin at a deeper level, where they do not yet exist as defined concepts.

By considering geometry as a result rather than a point of departure, a pathway opens to rethink some of the most persistent problems in cosmology. The initial singularity ceases to be a literal physical object and becomes a limit of extrapolation. The origin of the universe ceases to be a geometric instant and becomes a gradual physical process. Expansion ceases to be a primary datum and is understood as a dynamical response.

This change of perspective does not aim to replace existing formalism, but to complement it with a deeper interpretation. Whether it proves useful or not can only be decided in light of its internal coherence and its capacity to organize apparently disparate phenomena under a single physical idea.

In the next chapter, this same logic will be applied to one of the scenarios where geometry reaches its most extreme limits: black holes. There, the correlational hypothesis will allow exploration of whether these objects can be understood not as failures of space-time, but as limiting states of physical organization.

Chapter 5
Black holes as physical limits of geometric description

Black holes occupy a singular place in cosmology and theoretical physics. They are, at the same time, robust predictions of General Relativity and objects that push that formalism to its conceptual limits. Their observational existence is now well established, but their deep physical interpretation remains open.

Within the usual framework, a black hole is described as a region of space-time where curvature becomes extreme and where a singularity appears. That singularity does not represent an observable object, but rather a point at which geometric description ceases to be valid. From this perspective, the black hole is not only an astrophysical object, but also an indicator that the language of geometry reaches a limit.

The approach developed in this work invites this limit to be read in a different way. If geometry is not fundamental, but emergent, then black holes might not be anomalies of space-time, but physical regimes in which geometric description becomes inadequate because the system approaches a state of extreme correlation.

During gravitational collapse, matter does not only concentrate spatially; it also undergoes a profound reorganization. From a correlational reading, this process could be interpreted as a progressive increase in the degree of internal correlation of the system. As collapse advances, the spatial and temporal distinctions that sustain geometry lose operational meaning.

In this context, the singularity would not need to be understood as a physical point of infinity, but as the signal that the system has reached a regime in which notions of space and time are no longer useful descriptive tools. Geometry does not "break"; it simply ceases to be the appropriate language.

The event horizon then acquires a different meaning. Rather than being a purely geometric boundary, it could be interpreted as a relational boundary separating two distinct physical regimes. From the exterior, the system continues to be described through geometry and classical causality. From the interior, the degree of correlation could be so high that those notions lose applicability.

This reading allows a natural approach to the thermodynamic character of black holes. The fact that their behavior is governed by global quantities, such as horizon area, suggests that they are not conventional objects, but highly organized physical states. Entropy associated with the horizon could be interpreted as a measure of the loss of correlational accessibility from the exterior, not necessarily as a microscopic counting of internal geometric states.

The information problem can be formulated in a similar way. Rather than being posed in terms of loss or conservation within a fixed space-time, it could be understood as a transition between regimes. Information would not disappear but would be reorganized into a correlational state that is not describable from the emergent geometry of the exterior.

From this perspective, black holes would not violate fundamental principles but would reveal the limits of the categories with which we attempt to describe them. The paradox would arise not from physics itself, but from the attempt to extend an effective language beyond its natural domain.

Within the broader framework of the hypothesis, black holes could be seen as regions where the observable universe locally approaches the conditions of the highly correlated basal state. They would not be connections to another universe nor gateways to a spatial exterior, but zones where correlation reaches such a degree that geometry ceases to be an adequate description.

This interpretation does not aim to replace the astrophysics of black holes nor their observational models. Its value lies in offering a conceptual reading consistent with the central idea of correlational disequilibrium and in showing that the most extreme objects in the universe do not necessarily require new entities, but perhaps a change of perspective.

In the next chapter, this same logic will be applied to an even more fundamental notion: time. If geometry can emerge and lose validity in certain regimes, one may ask whether time shares that same nature and what implications this would have for causality and for the cosmological origin.

Chapter 6

Time as an emergent physical construction

Time is probably the most familiar and, at the same time, the most elusive concept in physics. It is constantly used to describe processes, order events, and define causality, yet its ultimate nature remains surprisingly unclear. In standard cosmology, time appears as one more coordinate of space-time, intimately linked to geometry and to the dynamical state of the universe.

If the idea that geometry is not fundamental but emergent is adopted, it becomes difficult to maintain time as a primary, independent entity. One may then explore the possibility that time does not exist as a defined magnitude in all physical regimes but instead emerges together with geometry from a deeper process.

In a highly correlated state, such as the one proposed for the Greater Cosmos, there would be no internal references that would allow one state to be distinguished from another. Without differentiation, there would be no physical criterion to establish a sequence. From this perspective, time would not be "stopped"; it simply would not be defined.

Time would begin to acquire meaning when the system leaves that state of near-perfect correlation and stable internal differences appear. The succession of those differentiated states, rather than an external parameter, could be what is experienced as temporal flow.

This interpretation makes it possible to understand time as a relational property. It does not flow by itself but is constructed as the universe organizes itself. The passage of time would be inseparable from the physical process that gives rise to the observable universe.

The relativity of time, as described by Special and General Relativity, would fit naturally within this framework. If time emerges from the physical state of the system, it cannot be absolute. Its rate would depend on the dynamical environment, the emergent geometry, and the degree of correlation present. Time dilation would not be an anomaly, but an inevitable consequence of its non-fundamental character.

The arrow of time, one of the most persistent conceptual problems in physics, could acquire a different reading. Rather than being derived exclusively from thermodynamic considerations, it could be associated with the direction of the correlational disequilibrium process. Time would have an orientation because the physical process that generates it is not exactly reversible.

This does not replace the second law of thermodynamics but suggests that the increase of entropy could be a late manifestation of a deeper directionality, established before the appearance of complex systems and observers.

Causality could also be reinterpreted from this perspective. Cause–effect relations would not be inscribed in a preexisting temporal structure but would arise together with time and geometry. An event would be the cause of another not because it occurs "before" in an absolute time, but because both form part of the same chain of physical organization.

This reading could help explain why causality appears so robust in the macroscopic world and, at the same time, so difficult to define in certain quantum regimes. Causality would be a stable emergent property, not a fundamental axiom.

In the cosmological context, this conception of time makes it possible to address the origin of the universe without resorting to an initial instant in the classical sense. The universe would not "begin" in time; time would begin with the universe. The origin would be a regime transition, not a temporal point.

This change of perspective does not aim to resolve all the paradoxes associated with time, but it does offer a coherent framework in which some of them can be reformulated. If time is emergent, its relativity, its arrow, and its limits cease to be isolated mysteries and become natural consequences of a single physical process.

In the next chapter, this same logic will be applied to a concrete and very current problem: cosmological tensions. It will be explored whether these discrepancies can be understood not as failures of the model or of the data, but as signals that the language with which we describe the universe is reaching its limit.

Chapter 7

Cosmological tensions as signals of a descriptive limit

In recent years, observational cosmology has entered a particularly revealing phase. As data has gained precision, persistent discrepancies have begun to appear between independent measurements of fundamental parameters. These discrepancies, known as cosmological tensions, have not dissipated with new observations, but have instead tended to consolidate.

Traditionally, this type of tension is interpreted as a technical problem: still unidentified systematic errors, biases in the data, or the need to extend the standard model with new parameters. However, there exists another, less explored possibility: that these tensions reflect a limit in the way the data are being interpreted, rather than a failure of the data themselves.

If the observable universe is an emergent manifestation of a deeper physical process, it is reasonable to think that certain cosmological parameters are not fundamental constants, but effective descriptors valid only within a specific regime. In that case, discrepancies between observations performed in different contexts would not necessarily be contradictory, but complementary.

The tension associated with the Hubble constant offers a clear example. Measurements based on the early universe and those obtained in the late universe appear to describe incompatible realities if it is assumed that both are measuring the same immutable constant. But if the expansion of the universe responds to a dynamic process of correlational relaxation, different observations could be capturing different phases of that process. The tension would not arise from a physical inconsistency, but from an excessively rigid interpretation.

An analogous situation appears in observations of structure growth. While the background expansion is described with great precision by the standard model, the growth of perturbations shows mild but systematic deviations. This behavior is difficult to accommodate if one assumes a fundamental geometry with a strictly fixed gravitational response. By contrast, it could be more natural if the observed gravity is an effective manifestation of an underlying process that does not express itself in the same way across all regimes.

Gravitational lensing observations reinforce this idea. By combining geometric and dynamical information, they reveal small inconsistencies that do not appear random. These tensions could reflect the fact that different effective descriptions are being used for phenomena that share a common physical root.

A notable feature of cosmological tensions is their internal coherence. They do not appear chaotically nor do they affect independent parameters. On the contrary, they concentrate on quantities related to expansion, geometry, and growth. This suggests that they may be pointing to an underlying structure not fully captured by the current framework.

From this perspective, tensions cease to be problems to be eliminated and become sources of information. Rather than indicating that the universe is incoherent, they may be indicating that the description employed is incomplete. The HDC–CBC hypothesis proposes that a reading based on correlational disequilibrium allows these discrepancies to be organized within a single conceptual scheme, without the need to introduce multiple independent mechanisms.

This approach does not aim to resolve each tension in isolation nor to offer immediate adjustments. Its ambition is more limited and, at the same time, deeper: to provide a language in which observational discrepancies do not appear as anomalies, but as natural consequences of an effective description pushed beyond its domain of validity.

Accepting this possibility implies a change of attitude toward the data. Instead of forcing the coherence of the model through increasingly complex extensions, the option is raised of revisiting the conceptual level at which the questions are formulated. It would not be a matter of correcting the universe, but of reformulating the way in which we describe it.

This chapter does not claim that cosmological tensions find their definitive explanation here. It proposes, more modestly, that they may be pointing toward the need for a deeper interpretative framework, in which concepts such as expansion, gravity, and geometry are understood as emergent from a single physical process.

In the final chapter, the conceptual trajectory of this volume will be synthesized, and the HDC–CBC/α hypothesis will be placed in its appropriate context: not as a closed conclusion, but as an open starting point for analysis, criticism, and debate.

Chapter 8

Final synthesis and meaning of the proposal

This volume, **HDC–CBC/α**, has been conceived as a conceptual entry point to a broader hypothesis, not as its closure nor as a formal demonstration. Throughout the preceding chapters, an attempt has been made to explore a possibility that is simple in its formulation but ambitious in its implications: that the observable universe may not be the deepest level of physical reality, but rather the emergent manifestation of a more fundamental process associated with correlation.

The path began by questioning the habitual primacy of geometry as a point of departure. Not to deny its validity, but to consider whether its extraordinary effectiveness might be due to its character as an effective description, arising once the universe has acquired structure, time, and causality. From there, the idea of a highly correlated basal state — the **Greater Cosmos** — has been introduced as a conceptual tool to think about the origin without presupposing precisely what one seeks to explain.

The principle of correlational disequilibrium has been proposed as an organizing idea capable of articulating this transition. Not as a closed law nor as an equation to be solved, but as a global physical criterion suggesting how the universe might evolve while keeping the imbalance between quantum coherence and emergent geometry dynamically compensated. From this principle, phenomena traditionally treated separately have been reinterpreted within a single narrative framework.

Dark energy and dark matter have thus appeared not as necessarily fundamental entities, but as effective descriptions of how that disequilibrium manifests itself in different regimes. Space-time geometry has been considered as a structural response, not as a prior stage. Black holes have been approached as physical limits of geometric description, rather than as paradoxical objects. Time and causality have been understood as emergent constructions, inseparable from the process that gives rise to the observable universe.

Finally, current cosmological tensions have been presented not as isolated anomalies, but as possible indications that the language with which we describe the universe is reaching its limits. From this perspective, observational discrepancies would not necessarily require local corrections, but rather a revision of the conceptual level at which the questions are formulated.

It is important to emphasize that none of what is presented in this volume is offered as a definitive assertion. HDC–CBC is not proposed as a new closed paradigm nor as an immediate alternative to the standard model. It is offered, in a deliberately cautious manner, as an exploratory hypothesis, whose value lies in its capacity to reorganize known problems under a common physical idea.

This open character is essential. The hypothesis only makes sense if it can be critically analyzed, developed, tested, or discarded. The technical developments of the HDC–CBC framework — collected in other volumes — exist to explore formal and observational consequences, but they are not necessary in order to evaluate the conceptual coherence of **Alpha**. This document seeks to situate itself at a prior level: that of the ideas that guide the construction of theories.

In this sense, **HDC–CBC/α** is simultaneously the end and the beginning. It is the last volume written, but the first that should be read. Not because it contains answers, but because it attempts to formulate the questions from a different place. Whether that place proves fertile or not is something that can only be decided through rigorous analysis and open debate.

If the proposed framework ultimately turns out to be incorrect, this volume will nonetheless have fulfilled its function as an exercise in reflection on the foundations of cosmology. If, on the other hand, some of its intuitions prove useful, **Alpha** will have served as an entry point to an alternative way of thinking about the universe, compatible with existing knowledge and open to its future evolution.

With that spirit, this work is brought to a close: not as a conclusion, but as invitation.

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"The present work is not based on any specific prior model but is conceptually informed by fundamental questions raised in the literature on cosmology, gravity, emergence, and the nature of space-time."

Abstract — HDC–CBC/α

HDC–CBC/α is presented as a foundational conceptual formulation of the **Hypothesis of Correlational Disequilibrium and the Correlated Bubble Cosmos (HDC–CBC)**. This volume is conceived as an introduction to the complete framework, with the aim of exposing its fundamental physical assumptions without resorting to advanced mathematical formalism.

The hypothesis explores the possibility that the observable universe is not fundamental but instead emerges from a deeper and highly correlated physical state, referred to as the **Greater Cosmos**. In this context, geometry, time, causality, and cosmological dynamics are considered emergent structures, not primary ingredients of reality.

The central organizing principle of the framework is introduced in its minimal form through a variational condition that expresses a dynamic equilibrium between the energy associated with quantum coherence and geometric energy. This principle is not proposed as a closed law, but as a unifying criterion capable of reorganizing several open problems in contemporary cosmology.

From this perspective, phenomena traditionally described as dark energy and dark matter are interpreted as effective manifestations of a single underlying process, expressed in different regimes. Black holes are approached as physical limits of geometric description, and the origin of time is considered as a consequence of relational differentiation, rather than as a preexisting parameter.

Finally, current cosmological tensions are discussed as possible indications of the limits of effective descriptions, rather than as inconsistencies of the underlying physical reality. **HDC–CBC/α** is explicitly presented as a speculative but coherent proposal, intended to motivate further analysis, criticism, and formal development, rather than to assert a definitive cosmological model.