

Two Theoretical Perspectives to Explain Big History: Fred Spier & Pedro Ortiz Cabanillas

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Citation | Contreras-Pulache, Hans; Eduardo Espinoza-Lecca, Moisés Diaz Palomino, José Atahualpa-Ynga, Elar Vallejos-Rojas, Nelly Lam-Figueroa, Marco Antonio Chávez-Chuquín, Gadwyn Sánchez-Félix, Karina Chicoma-Flores, Jeel Moya-Salazar (2024) Two Theoretical Perspectives to Explain Big History: Fred Spier & Pedro Ortiz Cabanillas.

Journal of Big History, VII(3); 42–52.

DOI | <https://doi.org/10.22339/jbh.v7i3.7309>

ABSTRACT

The central hypothesis of this research is that there are currently two theoretical proposals within the Big Story: the better known proposal of Fred Spier (1952 -) and the lesser known proposal of Pedro Ortiz Cabanillas (1933 – 2011) implicitly contained in his Sociobiological Informational Theory.

METHODS

We will proceed to present and synthesize the two theories of Big History made by Spier and Ortiz, comparing them and identifying points of contact and differences.

RESULTS

Spier's theoretical proposal presents the becoming of the universe in three moments: cosmological, biological and social. The epistemological basis being a qualitative theory of complexity. Ortiz's proposal (based on a qualitative theory of information) presents the evolution of the universe in six levels of complexity. In parallel, we would have: level 0 (Spier's cosmological moment); level one, two, three and four (Spier's biological level); and level 5 (Spier's social moment). There are occasional differences between the two approaches, but more are the articulations and points of contact.

CONCLUSIONS

The hypothesis of this research is correct: Spier (explicitly) and Ortiz (implicitly) have explanatory theories of Big History. Even if Spier and Ortiz never had contact (neither personally nor academically), their theories are articulated in the same explanatory scheme and are epistemologically nourished simultaneously. The Big History is strengthened by what is presented here.

KEY WORDS:

Information, Complexity, Macrohistory, Regime, System.

INTRODUCTION

The authors of Big History (also called Macrohistory) approach human history in the broad context of cosmic history: from the beginning of the universe to the present time (Hesketh, 2014). Thus, the claim of Big History is the explanation or understanding of the totality of the universe (Spier, 2005). To this end, Big History integrates and synthesizes studies related to the past but from a novel and coherent perspective that comes from, among other sciences, astronomy, geology, biology, anthropology (Christian, 2008). Big History is a relatively new field of knowledge and publications that brings together a myriad of authors (Vélez, 1994; Gamero-Valdivia, 1999; Christian, 2004; Noah-Harari, 2018, 2016, 2011) who show a global historical coincidence in the quest for explanation from a totalising vision (Conrad, 2017; McNeill & McNeill, 2004). It is crucial to note the creation of the Big History projects by Bill Gates and David Christian, the International Big History Association in August 2010, and the creation of the European Big History Network in September 2017.

In a general but synthetic way, the explanations (and the positions of the authors) within Big History can be grouped into two. On the one hand, we have the authors who use storytelling to present their Big History approach on the basis of specifically selected milestones. On the other hand, we have authors who do theory when explaining the Big Story. If we assume that water molecules move randomly in the oceans, then the job of a Big Historian (with a theoretical perspective) is to identify ocean currents, waves, tsunamis, etc. Specifically, Big History was born from the hand of the first approach (storytelling), and it is in the first approach that this discipline has reverberated and reverberates the most today (Villmoare, 2023).

From the second approach (theory) while explaining the Big Story, we have, to the best of the authors' knowledge, only one case: Fred Spier (Spier, 2023, 2011, 1996).

When theory is done in Big History, it is the theory that guides the explanation. A theory is evidenced from behind (inside or underneath) the historical landmarks. A theory explains, articulates, presents, organizes. In other words, it theories (redundancy aside) the historical landmarks. Since Big History is the history of the universe, a theory of Big History will always be a theory of the universe (i.e. a theory that explains the totality). This totality is reflected in the natural transdisciplinarity that Big History engenders. In this sense, a Big History theory is a kind of macro-theory that would include within itself a cosmological

theory, a biological theory, and a sociological theory at the very least. Such an explanation necessarily has or must have a complex systems approach and allows (or must allow) complex phenomena to be resolved. Because of all these ramifications, developing a theory in Big History is particularly difficult, which highlights how significant and innovative Fred Spier's work is.

Fred Spier studied biochemistry, cultural anthropology and social history in the Netherlands during the 1980s and early 1990s. This gave him the opportunity to research politics and religion in Peru, concentrating on a small rural community in the Zurite region of Cuzco called the parish of San Nicolás de Bari.

Fred Spier studies Big History from a theoretical perspective. He makes a theory, or he uses his theory. As the author himself points out. In 1996, he published the book *The Structure of Big History*, in which he outlines his theory of Big History in terms of "regimes" (an interdisciplinary equivalent that is more appropriate than the traditional concept of "system") (Spier, 2023, 1996). Sources for Spier's vision include, among others, the reflections of astrophysicist Eric Chaisson (Chaisson, 2001) and Erich Jantsch (Jantsch, 1980). Spier published *Big History and the Future of Humanity* (Spier, 2010, 2011), a book that synthesizes and formally states his theory of Big History, unveiling Big History as an interdisciplinary field (Spier, 2008).

On the other hand, a true example of theoretical creativity has been emerging in Peru since the 1980s. Pedro Ortiz Cabanillas, a Peruvian, carried out this action (1933–2011).

Ortiz developed a sociobiological explanation of the universe between 1984 and 1994. He then applied a general theory of information between 1994 and 2011, which essentially explains how the nervous system, the body as a whole, society, the individual, and the universe are related (or rather, how they are integrated and organized) (Ortiz, 2010, 2004, 1997, 1994). Ortiz is known as one of the most prominent neurologists, perhaps the greatest of all, within the Peruvian medical tradition (Contreras Pulache et al., 2019; Contreras Pulache et al., 2018).

On the other hand, there is no document citation or reference to consider that Ortiz was aware of the concept/discipline/word "Gran Historia". However, Ortiz's theory has an implicit Big History. A second theoretical approach to Big History will be exposed if this implicit Big History is discovered and made public.

Two theoretical perspectives on Big History will be discussed in this paper. One, that of Fred Spier, expressly stated and institutionally recognised in Big History studies. And two, the approach to Big History implicitly found in the theory of Pedro Ortiz Cabanillas (which, for the first time, this publication will make explicit).

METHODOLOGY

A qualitative, bibliographical study was made with a theoretical approach oriented towards the delimitation and analysis of the approaches of Fred Spier (1952-) and Pedro Ortiz Cabanillas (1933-2011). In the case of Fred Spier, his book “Big History and the Future of Humanity” (Spier, 2010) was used; while in the case of Pedro Ortiz, his book “Introducción a una Psicobiología del Hombre” (Ortiz, 2010) was taken into account.

The book “Big History and the Future of Humanity” compiles Fred Spier’s theoretical proposal in relation to Big History. In 1996, the author presented a preliminary version of his approach in the book “The Structure of Big History” (Spier, 1996). During the period between 1996 and 2005, Spier presented his theory in important research centres (such as the Santa Fe Institute, among others), and these experiences allowed him to give final shape to his proposal. In addition, at the University of Amsterdam, Spier created the Big History course, which today is a global teaching model for Big History, as evidenced by its adaptation to digital mass media, including the Big History digital course on the digital education platform Coursera. According to Fred Spier, his work “Big History and the Future of Humanity” summarizes all the experience accumulated between 1996 and 2005, presenting his final theoretical proposal on Big History. The author of this text attempts to explain the modern world in eight chapters, beginning with the Big Bang as the universe’s beginning. Thus, he takes into account the definition of key terms such as complexity, matter, energy, regimes, goldilocks conditions, among others. At the same time, he explains central aspects, such as the evolution of the cosmos, the emergence of life, the appearance of the brain and consciousness, primitive history and human history, states, globalization, industrialisation, including a vision of the future of humanity in terms of the state of the earth’s resources.

The book, in its second edition, “Introduction to a Psychobiology of Man”, by Pedro Ortiz Cabanillas,

consists of seven chapters in which the author sets out his Sociobiological Informational Theory that seeks to explain the universe, relating it to society in general and the nervous system in particular. In his book, Ortiz explains and develops themes such as the levels of organization of life and the related types of information, the epigenetic and kinetic determination of living systems, offering a genuine definition of information (a general theory of information) and of the individual as a personality. When Ortiz publicly announced his research project in 1980, it is evident that his aim from 1980 to 2011 was devoted to developing a clinical examination of a patient. However, by 1984, Ortiz realized that a theory of the universe would need to serve as the general framework for developing his clinical method. In this sense, Ortiz is not explicitly elaborating a theory (at least this was not his original intention) but it becomes a theory as a necessary condition for his own end: to have an explanatory mode of what people are like inside, and thus to explain their health and illness processes through an original and unique clinical examination. Rethinking conventional patient care methods, Ortiz’s clinical approach is one of those (as of yet unfinished) attempts to create a new human medicine (already at the explanatory, procedural, and diagnostic levels).

A thorough study of both volumes was conducted with the objectives of first determining the theoretical suggestions made by Spier and Ortiz, either openly or implicitly, and secondly outlining the key historical turning points that each theory suggested. Bibliographic sheets and comparison diagrams were made as a result. Furthermore, a 30 hour synchronous academic programme of 10 sessions was implemented, based on the general framework of a Reading Club entitled “Pedro Ortiz Cabanillas’ Informational Sociobiology as a Big History” that was conducted in Lima, Peru in the summer of 2023 under the direction of one of the authors (HCP).

In these academic sessions, selected excerpts from both books were critically read, commented on, compared and critiqued. A total of 10 professionals from different backgrounds (medicine, psychology, education, philosophy, history and other social sciences) participated in these sessions; all the authors of this publication were part of this group.

The following factors were taken into consideration in order to operationalize the theoretical concepts’ presentation and analysis:

- The Whole of the Big Story: which refers to how the “whole” is conceived in each of the authors’ theoretical proposals.

- Methodological strategies: related to the tools and methods followed by the authors in the process of exposition and elaboration of their theories.

- Explanation of complexity: which refers to the explanation of complexity presented within the theoretical explanation. Both Ortiz and Spier elaborate theories that explain complexity (Spier explicitly states this; Ortiz employs a novel understanding of the term “information” to correlate it with the complexity of living systems as informational systems. This implies the following: when Spier discusses complexity, it aligns with Ortiz’s discourse on informational systems). In both cases, the Big Story becomes more apparent as this intricacy plays out. The point of contact that enables Spier and Ortiz to communicate is complexity.

- Denomination: referring to the name assigned to it by each author in his exposition.

- Justification: which refers to the reasons given by each author for the goal or justification of their theory.

Finally, following the exposition of both authors, we have proceeded to specify the milestones of the Big History, which are explicitly or implicitly presented by both Fred Spier and Pedro Ortiz Cabanillas. Informative tables have been drawn up to present the results.

RESULTS

Table 1 shows the features of Fred Spier’s theory of the Big Story. This Big History takes place in 3 moments of complexity: before life (1), with life (2), and with the presence of men (3). Spier’s totality is the cosmological totality. Then, the totality of life, and finally, the totality of people and society. It begins with a Big Bang and runs through the entire history of the universe.

Table 2 shows the features of Pedro Ortiz Cabanillas’s theory of the Big History, implicitly stated in the development of his ideas. According to Ortiz’s Big History hypothesis, the cosmos is divided into six levels, Level 0 representing the age of the universe prior to the emergence of life. This concept is known as the Ortiz totality. The complexity that Ortiz explains would be (and in great detail) the internal complexity of all living things. In this sense, he deploys 5 informational levels of complexity. Society is the fifth level and includes people.

Both authors agree on the method. Beginning with the universe entails beginning with something higher above. To begin with the universe, according to Ortiz, is to begin with that which is further back. Both aspire to cover the totality of phenomena, showing the same approach that goes from the whole to the parts (and not the other way around). What Spier calls complexity level 1 (history before the presence of living beings) constitutes Ortiz’s Level 0. Spier’s cosmological unfolding has no equivalent (?) to Ortiz. Ortiz’s theory is not interested in the cosmological but in the natural philosophical. On the other hand, what Spier considers as the third level of complexity is for Ortiz the fifth level of informational complexity. Here, we can state that both theories move under the same symphony. In this sense, Spier’s second level of complexity is explained by Ortiz in four waves of detail that expand and deepen Spier’s horizon. And finally, Spier’s third complexity is exposed by Ortiz as part of the emergence of the fifth informational complexity: the explanation of the five levels of internal organization of a person, on the one hand; and, on the other hand, the explanation of “social information”. As for the future of Big History, the only one who has studied this is Spier; Ortiz does not refer to the aspect, and, likely, his interest in denying the Big Bang (a position Ortiz adopted around 2010) is in line with a disinterest in the cosmological future.

As for the Big Story milestones that are the basis of a narrative account, for example, Tables 3 and 4 are shown for Fred Spier and Pedro Ortiz Cabanillas respectively. It is striking that, in both cases, it is essentially the same extent of the universe. It is as if the difference between accepting or not accepting the Big Bang, on the part of Ortiz, does not mark any distance from a Big History approach that is consistent with the explanation of the origin of the universe. On the other hand, the contrast between Spier’s development of a cosmological and cultural dimension and Ortiz’s development of a biological dimension is evident. Ortiz’s contribution is evident in terms of an explanation articulated in processes. Processes of the internal complexity of living beings, including humans.

DISCUSSION

This is anecdotal: two authors working on the same ideas, developing their theoretical work in parallel, coincidentally, and without knowing each other, living in different social contexts but attending to the historical need to explain the

universe. Fred Spier represents the researcher connected with his time (the world). He presented his completely documented theory to the leading academics of his day in the 1990s, travelling to the most significant venues for complexity discussions. It could be argued that he was at the forefront of scientific knowledge, not only in Big History studies but also in complexity studies and various other fields. On the other hand, in Peru, Ortiz represents the researcher equally connected with his time (his country). During the 1990s and the first decade of the 21st century, Ortiz remained outside the scientific community. However, his scientific theorizing was exceptionally inventive, to the extent that it led to a complete reinterpretation of the structure of human psychic activity. It's not that Ortiz intentionally evaded or rejected the scientific avant-garde of his time; rather, he lived in a country (Peru, before the arise of internet era) disconnected from the more advanced scientific knowledge produced by developed countries. It is not that he was not interested, but rather that Ortiz lived in a country (Peru) that by the 1990s was beset by violence, plagued by terrorism, social crises, popular upheaval, cholera and dengue epidemics, and increasingly accustomed to power cuts in homes because electricity supply centres were the first target for destruction by subversive attacks; and the internet, of course, did not exist. The apparent distance between Spier and Ortiz would ultimately be the distance between the then so-called "first world" and "third world". It was not Ortiz who was cut off from the world, it was Peru; moreover, Ortiz is the one who came closest to establishing contact (which, evidently, did not happen while he was alive). The most interesting thing of all, no doubt, is that, starting with Ortiz and continuing with everyone else, no one suspected the existence of these parallels at the forefront of science (and, obviously, Big History science). The most fascinating fact of all, without a question, is that nobody at the forefront of science, beginning with Ortiz and continuing with everyone else, had any inkling that these analogies existed. On the other hand, it is remarkable how cut off a nation may be from the world order of ideas and how the solutions to the issues that the global order of ideas either cannot or dare not answer seem to dwell exactly in this cutoff.

Nowadays, in the first ten years of the current century, Ortiz established a master's and doctoral postgraduate curriculum at Universidad Nacional Mayor de San Marcos, the oldest institution in America. Evidently, this academic space served him for the development and formalization

of his own theory since the books used in the courses were those that Ortiz wrote; in other words, Ortiz wrote his books so that they could be studied by both master's and doctoral students, so that they could continue the development of theoretical research in their thesis programmes. In this respect he also resembles Fred Spier, who establishes a chair in Big History (at the University of Amsterdam) for exchange and research. As mentioned in the preceding paragraph, Spier and Ortiz have identical actions, but their concrete scopes differ. This is because Spier's action will depend just as much on his surroundings as Ortiz's will.

Ortiz was highly honoured during his lifetime (among many other honours, he was named a Fellow of the Royal Society of Medicine in 1996, elevated to the rank of Amauta of Peru in 2008, and given the Degree of Grand Cross by the Universidad Nacional Mayor de San Marcos in 2009) but despite all these merits, none of his work was internationally recognized. For example, nobody understood that in 1994, when Ortiz released his first book, he was delving into the same issues as the leading academics of the day. Ortiz planned to reconsider everything, just like them. There were unanswered problems for the academic avant-garde; for Ortiz, a reinterpretation was required. We may state that after more than ten years after Ortiz's passing and four decades of the existence of his theory, the merging of these two worlds (Spier-Ortiz) is occurring along these lines. This event should undoubtedly compel us to acknowledge the significance of what the Big History is propitiating, since the contact between Pedro Ortiz Cabanillas and Fred Spier is a result of vocation serving as a forum for interdisciplinary interactions.

The theoretical conceptions between Fred Spier and Pedro Ortiz Cabanillas overlap and touch. In short, Spier's cosmological level is Ortiz's "Level 0," Spier's biological level is Ortiz's "Level 1" (cellular), "Level 2" (tissue), "Level 3" (neural), and "Level 4" (psychic) and finally, Spier's cultural level is Ortiz's "Level 5" (people and society). A Big History that is strong in cosmology and firm as a philosophy of nature, flourishing in its explanation of life—all living things are reinterpreted in the context of a radically different understanding of the intricate interiority of living regimes—would result from continuing to integrate the knowledge (as one adds horizons) between Spier and Ortiz. Finally, when the authors' arguments are combined, we obtain a Big History that is expanded in its ethical horizon.

This publication shows a lot of history in Pedro Ortiz Cabanillas' theory. Explicitly, it is stated that such a big history is implicit in Ortiz's theory. However, Ortiz made his theory essentially a support of a clinical method that allows to reinterpret a person to attend to him as a patient or to train him educationally. Ortiz made his theory, in essence, because he was looking for a method of clinical examination of the neurological and psychological patient (Ortiz, 2006, 1999, 1996).

This dimension of Ortiz's theory as a technical instrument to clinically or educationally evaluate a person is difficult to integrate into the current framework of the Big Story. A Big History with these dimensions and magnitudes (the resulting Big History of Spier-Ortiz) would have the technical tools to understand the past and explain how and why we are where we actually are in order to understand the highest desired values. However it would also have the method for the moral transformation of society by people (i.e., the embodied forms of the highest desired values). This resulting Big History also found a new explanation of interiority—perhaps the first description of the inner complexity of living beings. It is, then, the Big Story where complexity studies unusually find a proposed solution to their most far-fetched questions. What would have happened if Spier-Ortiz (something that is more than the sum of its parts) had been in the 1990s visiting the most cutting-edge scientific centres? How would, for example, the complexity theorists of the Santa Fe Institute respond? And more importantly, what might they say today, after the results are unveiled here?

Additionally, this resulting Big History adds the possibility of articulating with the work of other authors such as Niklas Luhmann (1927–1998) and Fritjof Capra (1939–); both (from the perspective of “systems,” a concept equivalent to “regimes”) propose an additional understanding of the social level of complexity (Luhmann, 2007) and the very embodiment of the scientific paradigm shift (Capra, 1997; Capra & Luisi, 2014).

Stated differently, the authors' understanding of a component yet unexplored in the Big History studies literature—the autopoietic potential of conceptual connections—would thereby incorporate in itself the new scientific paradigm (in Kuhn's terminology).

In his book, Spier (2011) predicts that whoever has a way of explaining the complexity of life is assured of an entire research programme, and he claims that it will most likely not require much in the way of technology. However,

while Spier maintains this certainty, Ortiz does all this in a parallel way. Between 1984 and 2011, Ortiz developed informational sociobiological theory with nothing more than a pencil, a few sheets of paper, his inveterate curiosity, and a very solid clinical training as a neurologist. Ortiz's contribution is not associated with great technology but with a very powerful reinterpretative capacity. In this sense, Ortiz's case shows that what Spier says is true; Ortiz himself is the proof.

Epistemologically, the preference here has been to seek a dialogue between two authors (leading to the resulting integration of the two) rather than a comparison to identify similarities or differences between two perspectives that complement each other. The development of Spier's conception of the state goes far beyond what Ortiz touches on even in his most political book, “*Ética Social*” (Ortiz, 2007).

On the other hand, this article has asserted that there is currently only one theoretical proposal in Big History (developed by Fred Spier) and that what Pedro Ortiz Cabanillas proposes represents an alternative. This can be debated, and it undoubtedly represents a limitation of our publication. In the future, it is expected that research will be conducted to contrast the potential theoretical proposals of Eric Chaisson (in his book “*Cosmic Evolution*”), Tyler Volk (in his book “*Quark to Culture*”), and even Alexander von Humboldt (in his book “*Cosmos*”). Thus, this publication firmly establishes itself as the formal inception of a line of research aimed at contrasting and elucidating the existing theories within Big History.

Spier reviews the core aspects of the state through the two monopolies it holds—the use of force and the collection of taxes—and then discusses the emergence of agricultural religions, moral religions, and the three waves of globalization. He also explains the religions with the new activities carried out by the first societies and the modifications and impositions of new patterns of behaviour that they force. On the other hand, Ortiz focuses on the history of mankind in more or less defined stages, primitive, ancient, and modern, in which a type of predominant social information emerges: traditional, cultural, and economic.

An aspect for further research would be to go into an exhaustive synthesis of the latter complexity for both Ortiz and Spier. Ortiz's explanation necessarily leads to considering education, health, and ethics as three social technologies. Tools that people rely on to construct their higher morality. In the closing of his book, Spier says that

the matter is whether to continue as before or to change. Ortiz would agree with highlighting the need to give an answer to this question. Sadly, Ortiz is no longer with us to discuss with Spier; yet, in the spirit of Spier-Ortiz, we have to acknowledge that only humans possess the capacity to live on in their thoughts and works, that is, the capacity to transcend death. This article clearly attests to this state of affairs.

CONFLICT OF INTEREST STATEMENT

The authors declare that they have no conflicts of interest.

ACKNOWLEDGEMENTS

Sincere gratitude is owed to Fred Spier of Amsterdam, who accompanied and mentored us on this intellectual journey, and to the EDUNEURO Collective, which in Peru is fast emerging as the centre for rigorously studying and advancing the theory and methodology left by Pedro Ortiz Cabanillas.

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Table 1. Characterisation of Fred Spier’s theory

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| The whole of the Big Story | <p>The whole is the extension from the origin of the universe (the Big Bang) to the present day.</p> <p>It presents a position that assumes a big bang.</p> |
| Methodological strategies | <p>Perspective: holistic.</p> <p>Big History attempts to map knowledge of the whole past.</p> <p>It uses the scientific method from the whole to the parts.</p> <p>Its description is top-down: from the subatomic particles of the universe to the galaxy, the solar system, the earth, life, culture.</p> |
| Explanation of complexity | <p>It interchanges the term “regime” with the term complexity.</p> <p>He conceives of three general levels of complexity:</p> <ol style="list-style-type: none"> 1. That of physically inanimate nature. Non-living matter. Cosmic matter. Pre-biological stage. No information centres exist. 2. That of life. The information centre is in the DNA. Life is sustained by gathering matter and energy. 3. Culture. This is the information stored in the nerves and brain cells of human beings. <p>A regime is more complex the more numerous and varied the connections and interactions that take place between the fundamental elements and the greater the number and diversity of these.</p> <p>He argues that the cause of the emergence and disappearance of all forms of complexity is energy flowing through matter under certain boundary conditions, which he calls “Goldilocks” conditions.</p> |
| How is it named | <p>Qualitative approach to complexity.</p> |
| Support | <p>To act as an interdisciplinary forum and to spread consciousness on humanity’s future.</p> |

Table 2. Characterisation of Pedro Ortiz Cabanillas's theory

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| The whole of the Big Story | <p>It has, not explicitly but implicitly, a Big History.</p> <p>The universe is understood as a totality of phenomena rather than as a cosmological entity. Within this totality (the universe), Ortiz explains the emergence and development of the complexity (of the levels of organisation) of all living beings.</p> <p>On the origin of the universe, in the most mature version of his theory, there is no assumption of the Big Bang, and he assumes the premise that matter is infinite, has no beginning and no end, and is eternal.</p> |
| Methodological strategies | <p>Uses the deductive scientific method.</p> <p>It can be placed inside the systems theory tradition.</p> <p>More than a theory in itself, what Ortiz offers is a dialectical (not metaphysical) method of reinterpreting the totality of the phenomena of the universe. In short, more than an explanation, Ortiz's theory is an instrument for reinterpreting the phenomena of the universe in their totality.</p> |
| Explanation of complexity | <p>He uses the term "system" to refer to any region of the universe that is the subject of scientific observation.</p> <p>The universe is composed of ordered and organised systems.</p> <p>Complexity is characteristic of organised systems. There is complexity only in living systems (i.e., organised by information). What becomes complex is information.</p> <p>Ordered systems are level 0 of the universe.</p> <p>Organised systems can have five levels of complexity:</p> <ol style="list-style-type: none"> 1. Unicellular (organised by cellular information). 2. Tissular (organised by metabolic information). 3. Organisms (organised by neural information). 4. Psyches (organised by psychic information). 5. Society (organised by social information). <p>Information organises a living system; furthermore, Ortiz proposes a second definition of information: information is reflecting the internal world of the living system with the world external to the living system.</p> |
| How is it named | <p>General information theory.</p> <p>Dialectical social psychobiology.</p> <p>Sociobiological information theory.</p> |
| Support | <p>To serve as a basis for a comprehensive clinical examination and ethical training of people. It formulates a social theory of man. It is argued that the history of society determines the history of individual human beings, and the relationships of individual human beings also determine the history of society.</p> |

Table 3. Milestones of the Big Story by Fred Spier

- 13.7 billion years Before Present (AP): The Big Bang
- 4 first minutes After the Big Bang (GBD): Emergence of Elementary Particles.
- 4-15 minutes DGE: Nucleosynthesis of deuterium, helium, lithium, and beryllium.
- 50,000 years DGE: Transition from the era of radiation to the era of matter.
- 400,000 GID: Neutralisation of the universe and emergence of the cosmic background radiation.
- 700-2,000 million years AGE: Emergence of galaxies and stars.
- 4.6 billion years BP: Formation of our solar system.
- 4.6-4.5 billion years BP: Emergence of telluric planets.
- 4.5-3.9 billion years BP: Hadean Era, including cosmic bombardment.
- 3.8-3.5 billion years BP: Emergence of life.
- 3.4 billion years BP: Appearance of the oldest known stromatolites and emergence of photosynthesis.
- 2 billion years BP: Appearance of free oxygen in the atmosphere and the emergence of eukaryotic cells.
- 540 million years BP: Cambrian metazoan explosion.
- 400 million years BP: Life conquers the earth.
- 200 million years BP: Rise of warm-blooded animals.
- 63 million years BP: Asteroid impact supposedly ends the reign of dinosaurs and opens the door to the future dominance of mammals.
- 4 million years BP: Emergence of bipedal australopithecines.
- 2 million years BP: Appearance of *Homo erectus*.
- 200 million years BP: Emergence of *Homo sapiens*.
- 10,000 years BP: Emergence of agriculture.
- 6,000 years BP: Creation of the first states.
- 500 years ago: First wave of globalisation.
- 250 years ago: Second wave of globalisation (industrialisation).
- - 60 years ago: Third wave of globalisation (computerisation).

Table 4. Milestones of the Big Story by Pedro Ortiz Cabanillas

- The universe has always existed.
- 4.500 million years ago: The culminating process of the evolution of the solar system began with the formation of the Earth. Beginning of the transformation of inert matter into living matter.
- 4.500-1.500 million years ago: Chemical evolution, biogenesis processes (emergence of cellular systems).
- Last 1,000–700 million years ago: Appearance of multicellular living systems with a body axis, process of histogenesis (emergence of tissue systems): Spongiaria and plants.
- Last 600 million years: Integration of tissues up to the formation of nerve networks specialised in the transmission of electrical signals, process of organogenesis (emergence of organ systems).
- Last 200 million years: differentiation of the brain until the formation of the cerebral cortex, process of psychogenesis (emergence of psychic systems or psyches): higher vertebrates.
- Last 7–6 million years: Hominisation processes, diversification of hominids into various species of the genus *Homo*, culminating in the emergence of *Homo sapiens*.
- Last 700,000 years: Process of humanisation, development of the species *Homo sapiens* to become Humanity (structuring of the cerebral neocortex as a memory capable of codifying the procedures of manual transformation of natural objects and language).
- Last 70,000 years: Socialisation processes, social restructuring of humanity, and society as we know it today. We call this transformation a process of sociogenesis.

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