HERMENEUTIC AND PEDAGOGICAL PERSPECTIVES OF THE RELATIONSHIPS BETWEEN SCIENCE AND RELIGION

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Abstract

In recent decades, a change occurred in the rigid ways in which the subject 'Science and Religion' had been approached in previous centuries. This has made it possible to test various ways of understanding the interaction. In this article a typology is proposed that compliments the already classic ones in the classification of the links between science and religion. It is a typology that does not intend to replace the previous ones, but rather to account for the dynamics of the process and, in particular, for its novelties. In this way, more multidimensional approaches to the phenomenon can be tested, such as the aesthetic and hermeneutical approach. To illustrate this, the example of the hermeneutical reading of the phylogenetic tree is used. Finally, its value for Pedagogy is shown synthetically, taking into account precisely the new way of understanding of recent generations, less articulated by the paradigms of conflict. The proposal is formulated in an academic but also pedagogical framework, since the importance of the Science and Religion interface for education is presupposed, in order to energize complex thinking in a plural and mobile culture.

Keywords: Science and Religion, typologies, education, Tree of Life, Hermeneutics

1. Introduction

In the public opinion of our time, science and religion seem in conflict: there is a 'versus' that relates them, not an 'and' coordinator. The model of 'conflict' has been instilled almost as an irrefutable paradigm since the episode of Galileo Galilei. However, a historical journey shows that the conflict model does not account for a story where the mutual interactions are multiple [1]. In recent decades, there has been a rejection of the conflict model. This has made it possible to test various ways of understanding the interaction of science and religion.

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In the present article, after synthesizing two classic typologies of science and religion, another one is proposed that can show the dynamics of the phenomenon, especially in our time. Subsequently, a case is exemplified by the possibilities opened up our time to make an approach to the phenomenon. Finally, the potential application of this model of access to the interaction of science and religion in the field of education is proposed.

2. Classifications of the links between Science and religion

Some authors have proposed classifications of the modes of relationship between Science and religion [2]. We mention two of them and propose a third, with the aim to project it in a pedagogical application.

2.1. Barbour typology

The most accepted for its simplicity and clarity is the typology proposed by Ian Barbour who classifies the possible relationships between science and religion into four modalities: 1) conflict, 2) independence, 3) dialogue, and 4) integration [3, 4]. It is a scheme that identifies the scope and limitations in the concrete relationships between scientific disciplines and religion.

1. The category of 'conflict' consists in the idea that Science and religion make rival literal statements about the same domain. Both positions agree that a person cannot both believe in God and science. The conflict model uses the rhetoric of war to express what happens in the link between Science and religion.
2. This approach insists that Science and religion are to be seen as independent, autonomous fields of study or spheres of reality, each with its own distinct rules and languages. Science can little to say about religion, and religious beliefs, and religion can little to say about scientific study.
3. Dialogue portrays constructive relationships between Science and religion. Dialogue may arise from considering the presuppositions of the scientific enterprise, or from exploring similarities between the methods of Science and those of religion, or from analysing concepts in one field that are analogous to those in the other. Dialogue emphasizes similarities in presuppositions, methods, and concepts.

The fourth model is the integration model. It takes dialogue much further and posits that the truth of Science and religion can be integrated into a unique vision. There are at least three examples of integration model: Natural Theology, Theology of Nature, and Systematic Synthesis.

2.2. Haught typology

Based on the Barbour classification, the theologian John Haught proposed the following five categories of relationship between Science and religion: conflation, conflict, contrast, contact and confirmation [5].

1) Conflation is the merging of two or more sets of information, texts, ideas, opinions, etc., into one, often in error. In logic, it is the practice of treating two distinct concepts as if they were one, which producing errors or misunderstandings as a fusion of distinct subjects tends to obscure analysis of relationships which are emphasized by contrasts. Conflation in Science and religion means, according to Haught, the collapsing of distinct terms in such a way that their differences are apparently lost.
2) The idea of conflict here is the same as in the previous typology, that is, that Science and religion are irreconcilable with each other.
3) The category of contrast indicates that cannot be a genuine conflict because Science and religion are each responding to radically different questions.
4) The contact is an approach that looks for dialogue, interaction, and possible 'consonance' between Science and religion, and especially for ways in which science shapes religious and theological understanding.
5) The confirmation is the perspective that highlights the ways in which, at very deep level, religion support and nourishes the entire scientific enterprise.

2.3. A complementary classification

The two mentioned typologies have demonstrated a clear fertility in the academic field. However, they offer a weak aspect: they privilege the conflict model in their analysis. In reality, such a position responds to the specific situation of Western modernity. However, current historical studies show that the conflict was not the axis of the relationship between science and religion. This situation is corroborated in the studies on non-Western cultures [6].

We propose the following classification, simply as an outline and complement to those previously mentioned. The criterion of this type is to consider the relationship as a dynamic phenomenon and, therefore, historical, in order to account for the various nuances produced.

2.3.1. Pre-critical and symbolic integration

It is based on an obvious fact, which consists of a large part of ancient cultures that are emerging before highly developed sciences. They are usually basically descriptive sciences, although in some there are also high levels of abstraction - such as, for example, Mathematics and Astronomy between the Aztec and Maya civilizations. Such knowledge coexisted with strong religious structures; in general, the sciences were subordinated to the prevailing religious systems. However, in such cultures the absence of a well-developed philosophical thought prevented a conflicting situation: religion and Science coexisted without disruptive questioning. In these cultures there was a symbolic-religious framework that operated as the ultimate horizon of understanding, and that integrated scientific knowledge into a unitary vision.

2.3.2. Critical-autonomous situation

This is understood as the emergence of an awareness of the autonomy of Science and its methods. Although there were some precedents in the western middle Ages, the process that led to such awareness occurred mainly with the modern scientific revolution. The debate over heliocentrism was leading to a growing opinion about the need to methodologically delineate the sciences of both Theology and Philosophy [7]. Philosophical arguments were placed for this, but theological foundations are also produced. For example, Galileo Galilei updated the topic of the 'two books', present since the patristic period [8]; the Italian astronomer used that expression to legitimize the autonomy of the natural world, a readable book in mathematical code.

However, the assimilation of the scientific autonomy in the academic community was a slow process. In fact, until the late nineteenth century it is possible to find scientific texts with theological references.

2.3.3. Autonomy in action

This is the state of peaceful possession of the epistemological place of each discipline itself - this coincides with the typology 'independence' in the nomenclature of Barbour. Sciences develop their activity through their methods and theories, whereas religion lives peacefully within their beliefs, projecting a certain worldview that fails to have a conflictive intersection with the vision of the scientific world of his time.

2.3.4. Critical-conflictive situation

Once the situation of autonomy of sciences and religion is consolidated, conflicting episodes may arise again when, for example, a new scientific theory impacts on some aspect of the religious worldview; or when a particular theory crystallizes and it is perceived in contradiction with some aspect of a religious vision of reality; or, also, when a certain theology is positioned in a literalism (e.g. creationism).

2.3.5. Academic distancing

It occurs when the academy ignores one of the two terms of the relationship. The most frequent position is that of scientists who omit the religious pole of both teaching (for example, omitting any type of systematic information about religions in curricula); or in interdisciplinary fields of research where reference to areas of meaning that complement purely empirical visions of the phenomenon addressed is inevitable (e.g. in medical or ecological bioethics). But it can also happen, in another area of knowledge, that the same philosophy distances itself from the sciences; or that philosophical thinking omits the religious dimension as an important part of the human phenomenon.

2.3.6. New post-positivist relations

The crisis of the classical positivist paradigm is in the general framework of the crisis of the strong reason of the Western Modern Age, in which the totalizing models (Hegelianism, positivisms) are replaced by a vision of a fragmentary reason: a human intelligence that is 'weak' [9], unpretentious to produce global systematizations. In the area of science, since the introduction of the falsifiability criterion as an essential element to the scientific method and the historical concept of 'paradigm', the positivist conception of science has been questioned [10, 11]. The sciences today are more aware of their limits.

2.3.6.1. A-logical juxtaposition

In Postmodernity scientific rationality subsists along with other rationalities or forms of knowledge: it is, in fact, a 'Modern Postmodernity' [12] or a 'Liquid Modernity' [13]. In the cultural climate of this age of thought it seems that it oscillates indifferently between various rationales, or even forms not considered scientific. In this type of thinking there is place for religious experiences that would not pass the positivist critical sieve. The final effect is juxtaposition devoid of internal logic, where eclecticisms coexist with syncretisms without an awareness of regret for such logical contradiction.

2.3.6.2. Views from the complexity approach

Depletion of specialisms and deterministic thinking has led to the search of interdisciplinary or transdisciplinary methods where there is more space for integration [14]. The sciences of complexity in particular, open up ways of approaching phenomena in which there is room for the interrelation between Science and religion. This enables varied readings of the religious and scientific phenomenon, without thereby renouncing the objective dimension of them. It is a completely inverse path to the renunciation of the internal logic of phenomena.

2.3.6.3. New epistemological hierarchies

The emergence of new sciences, largely due to the integration of some of them, i.e. Biophysics, Neurobiology, Astrobiology, reconfigures the epistemological picture. However, there remain large areas (exact, natural, human, religious sciences) whose ties depend on the valuation of ways of thinking, whether strictly empirical-mathematical, or strictly hermeneutical. These make up the sciences of the 'explanation' (*Erklärung*) and the sciences of 'understanding' (*Verstandung*), according to the classic distinction of W. Dilthey [15].

2.3.6.4. Neo-fundamentalisms

2.3.6.4.1. Neo-positivisms or neo-scientisms

Some versions of analytical philosophy present a reduction of knowledge to formal logic. To the extent that they work on the elucidation of the logical structures of scientific theories and systems, they contribute to the permanent task of Science by becoming a "serious or mature science" [16]. However, in some versions of the analytical project a more radical intent is perceived: the subordination of all scientific knowledge to logical-mathematical structures. They have their bases in certain principles that they cannot support. These are new versions of Platonism, in which the mathematical emerges as a total world. Thus, we return to new forms of reductionism to the Mathematics or to the Logic.

2.3.6.4.2. Technocratic fundamentalisms

These are visions that understand technology as a legitimizer of any kind of knowledge. They usually appear in alliance with the economy and supported by renewed ideas of progress. The various modes of 'Transhumanism' are examples of this type of model.

2.3.6.4.3. Consumerism

Vision that considers man as a mere consumer, regardless of other dimensions of knowledge: the truth value of reality; limiting factors such as the finiteness of the planet experienced in the ecological crisis; the aesthetic dimension; etc. Such anthropology ignores any claim of objective knowledge of reality, focusing on consumption and, consequently, on the modes of exploitation of the planet as a result. As a writer has said graphically, the world is considered as a supermarket [17].

2.3.6.4.4. New forms of religious fundamentalism

Some of them place science according to political-religious programs. There are others that formulate renewed expressions of creationism, partly due to the absence of an incorporation of the hermeneutical sciences as an instrument for reading the sacred texts, but also partly because of the crystallization of scientific paradigms that prevent all types of religious approaches, over all to less scientifically illustrated sectors. These new 'fundamentalisms' differ from those of previous centuries for the same reason that the above points: the critical assimilation of modernity and its postmodern context.

3. Reversing the paths - hermeneutics of a Tree of Life in view of a pedagogical proposal

The previous exposed typologies serve to mistrust unequivocal income in questions where there is an interrelation between science and religion. The dynamism of knowledge and human experiences lead to the relationship being unstable and taking new forms when one of the poles undergoes a major change.

One of the positives of the last phase of the history of the relationship between science and religion is the rejection of a rigid attitude, as occurred in previous centuries. Such a situation includes the possibility of overcoming the purely conflicting approach.

Among other issues, and as mentioned in the third of the typologies, there is the possibility of varied approaches to science and religion. We are interested in taking an example of a new approach in view of an application in the pedagogical plane. The proposed example consists in an aesthetic and hermeneutic approach of the phylogenetic tree.

This proposal includes some aspects considered in the previous typology. In particular that it is possible to approach nature not only in an empirical and mathematic way, but through other perspectives such as aesthetics and hermeneutics. The post-modern situation allows that, even without devaluing the methodology of the sciences, other approaches to the natural world are admitted. We propose, then, a combined access: the aesthetic and hermeneutical approach to a scientific object.

The example, then, consists of an aesthetic and hermeneutical access to a scientific product, that is, an approximation from the scope of meaning to an object produced in the area of scientific explanation. In the Dilthey terminology it can be expressed as a relationship from the world of 'understanding' a product intended for 'explanation' [15, 18]. The post-modern framework (liquidity of thought, criticism of pure positive rationality, and assessment of interpretive paths) enables a hermeneutical treatment of a scientific object without diluting its explanatory specificity. In particular, the image allows access to the conceptual which then facilitates the understanding and explanation of the phenomenon studied.

3.1. The image of the phylogenetic tree

The graphic of the tree of life or phylogenetic tree has a complex history [19]. Charles Darwin himself drew a scheme of a tree to represent the history of life [C. Darwin, Notebook 'B', 1837-1838, 26; 20], but just as a way to express the idea of the descendants with modification from a common ancestor. From that period there were countless efforts to formulate a method for phylogenetic reconstruction and its graphic representation by means of a genealogical tree.

The phylogenetic tree is model of structuring the history and diversity of life by means of a graphic. The tree includes morphological aspects that can be visibly incorporated, as well as genetic or molecular characteristics; it also

integrates temporal dimensions, originated in the researches of Palaeontology, and spatial aspects proposed by biogeography. All these dimensions are included in the construction of the trees. These aspects enable the determination of features a certain individual, population or species possesses in order to express them graphically. Resorting to individualizing techniques (e.g. morphological description, genetic sequencing description, dating, comparison, and bio-geographical data) population continuities are established which are completed by means of hypotheses in those cases where species belong to the past. Current genomic sequencing techniques make corroboration or improvement of the lines that illustrate relationships and origins among species possible [21].

3.2. The 'Tree' as a neutral and semiotic object

In any of its versions the Tree of Life consists in a translation of the phylogenetic phenomenon into an *image*. Through a complex abstraction process of morphological and genetic notes different branches are composed. The Tree formalizes what evolutionary biology detects in the connection of living beings along time. The path from phylogenetic to the formalisation in an image such as that of a tree presupposes yet another abstraction: certain elements are transferred to a geometrical graphic. This, in turn, being a formal graphic, reaches a new level in the process of understanding: it becomes an image integrating perception for any given reader. One, at a glance, shall be able to grasp the fruit of countless observations and theories. It is possible to say that: "…semiotic growth is dialectical in that new symbolic contexts offer new possibilities for iconicity, and new icons invite new developments in symbolically mediated understanding. It is in novel juxtapositions of different sign types, not in a unidirectional progression towards a superior kind of sign that new cognitive possibilities arise." [22]

In this context, it is possible to infer that the *Tree of Life* constitutes a symbolic *image*. Science has recurrently resorted to images or metaphors in history [23]. The tree seems to be a metaphor and a symbol at the same time: it compares linguistically the biological life with the word 'tree' (or 'net' or 'bush') and it guides to a symbolic line of understanding. In fact, the symbol is rooted in things themselves and it consists of one of its several properties to suggest meanings that surpass its univocal reading [24]. That is the case of realities such as the way, water, the sun, etc., traditionally read in a symbolic way by the religions. Some philosophers affirm the conventional character of symbols, but others support their importance in the aesthetic, religious, and metaphysical understanding of human being.

Systematic Biology helps us go in that hermeneutic direction, because it tries to present a comprehensive view of the phenomenon of life. It does that through the Parsimony principle and the techniques to draw the graphics in the more simple way, in order to propose a clear perception of the history of life. Curiously, the graphics, regulated by epistemological and logical mechanisms, allow one to go beyond them toward symbolic readings [25].

The phylogenetic image does not include explicit ideas in itself. In fact, the understanding of the tree needs neither the Natural Selection principle nor Genetic theories nor any other theoretical explanation about the evolutionary process. The tree primarily shows the community of living beings and their probable common origin.

In this respect, the image constitutes a field of perception of evolution shared by different scientists. Consequently the tree appears as a neutral figure: it indicates the community of the species of living beings, not the explicative theories to justify it.

4. Perspectives of the Tree of Life to the pedagogy of Science and religion

It is a well-known expression by the hermeneutics philosopher Paul Ricoeur that the symbol "gives to think" [26]. Certainly, he applied this idea to the natural and traditional symbols. It is not the case for the tree of life, which is a scientific image. Anyway, because of the intentionality of that image, it is possible to widen the perspective and to apply the hermeneutic idea of Ricoeur to this image too.

In this sense, and following this way of amplification of the idea of symbol, it is possible to infer that the tree *gives to think* beyond its univocal first aim - i.e. the phylogeny - towards a global perspective of the history of life. Any reader, any mere observer, directing his/her look to this graphic, can go beyond it towards an integral comprehension of the phenomenon of the life. Even though the tree is a scientific construction - and as such, provisional - it operates as a symbol because its ability to generate a meta-univocal understanding of the life.

The pedagogical dimension of the proposed example consists in the fact that the tree of life allows the students the intuitive access into the evolutionary process, without the necessity of the explanatory elements. Obviously, the image does not replace the empirical and epistemological explanation: it supposes and needs them. Nevertheless, that image favours a global vision of the phenomenon of life, including the perception of the place of *Homo sapiens* into this phenomenon. In fact, the tree allows a vision of the location of humans in the history of the planet and the biosphere. And, in this way, the image of the tree, although it removes the human being from the centre of history of the life, it shows his deep relationship with the rest of the species.

For these reasons, it is possible to consider the phylogenetic tree as a suitable instrument to begin a dialogue with the religious vision of the life. Particularly, the tree allows an intuitive relationship of perceptions supported in the field of biological evolution of living beings. That intuitive contact, given by the image of the tree, facilitates a perception of the mystery of life and of man in his evolutionary historicity to be articulated in a theological understanding of the created life.

5. Conclusions

The path proposed in the article has been as follows: firstly, a presentation of the typologies already established on the relationship between science and religion. Secondly, an update of the typologies has been presented through another that further articulates the historical dynamism of said relationship. Thus, it shows the possibility of diverse access to the relationship, such as an aesthetic and hermeneutical approach. Subsequently, we have exemplified such an approach through the case of the phylogenetic tree. And, finally, we have mentioned its fertility for the pedagogical field, since the image can propose various readings without directly entering the conceptual debate.

Obviously, it is a terrain of research that needs to be further developed. The present work has only wanted to show the logical thread of this procedure. And, through an example, an attempt has been made to indicate possible alternative ways of accessing the relationship between science and religion, with a special interest in the educational field.

References

[1] J.H. Brooke, *Ciencia y religión. Perspectivas históricas*,. Sal Terrae-Comillas, Madrid, 2016, 1-68.
[2] R.J. Russell and K. Wegter-McNelly, *Ciencia y teología: una interacción mutua*, in *Ciencia y religión en diálogo. Un puente en construcción*, G. Bennett & T. Peters (eds.), UPAEP, Puebla, 2005, 3-28.
[3] I. Barbour, *Religion and Science: Historical and Contemporary Issues*, Harper Collins, San Francisco, 1997, 159-164.
[4] J.J. Blázquez Ortega, *Los modelos de relación ciencia-religión según Ian Barbour*, in *Memorias del Seminario Interinstitucional sobre el diálogo ciencia-fe*, J.C. Casas García & A. Anguiano García (eds.), vol. I, Universidad Pontificia de México, México D.F., 2014, 47-55.
[5] J. F. Haught, *Cristianismo y ciencia. Hacia una teología de la naturaleza*, Sal Terrae, Santander, 2009, 171-177.
[6] J.H. Brooke and R.L. Numbers, *Science & Religion around the World*, Oxford University Press, New York, 2011, 120-251.
[7] R.G. Olson, *Science & Religion 1450-1900. From Copernicus to Darwin*, The John Hopkins University Press, Baltimore, 2004, 1-24.
[8] O. Pedersen, *The two books. Historical Notes on Some Interactions Between Natural Science and Theology*, University of Notre Dame Press, Notre Dame (IN), 2007, XV-XIX.
[9] G. Vattimo and P.A. Rovatti, *Il pensiero debole*, Feltrinelli, Milano, 1983.
[10] T. Kuhn, *La estructura de las revoluciones científicas*, Fondo de Cultura Económica, México, 2006, 80-91.
[11] M. Artigas, *Popper, Karl Raimund*, in *Dizionario Interdisciplinare di Scienza e Fede*, G. Tanzella-Nitti & A. Strumia (eds.), vol. II, Urbaniana University Press – Cittá Nuova, Roma, 2002, 2057-2961.
[12] W. Welsch, *Acta humaniora. Schriften zur Kunstwissenschaft und Philosophie: Unsere postmoderne Moderne*, VCH, Weinheim, 1987.
[13] Z. Bauman, *Modernidad líquida*, Fondo de cultura económica, Buenos Aires, 2013.

[14] E. Morin, *Le systeme, paradigme ou theorie?*, in *Science avec conscience*, E. Morin (ed.), Fayard, Paris, 1983, 172-189.
[15] C. Mantzavinos, *Hermeneutics*, in *The Stanford Encyclopedia of Philosophy*, Spring 2020 edn., E.N. Zalta (ed.), Stanford, 2020, online at https://plato.stanford.edu/archives/spr2020/entries/hermeneutics/.
[16] M. Ruse, *El misterio de los misterios. ¿Es la evolución una construcción social?*, Tusquets Editores, Barcelona, 2001, 276.
[17] M. Houellebecq, *El mundo como supermercado*, Anagrama, Barcelona, 1998.
[18] P. Ricoeur, *Del texto a la Acción. Ensayos de Hermenéutica II*, Fondo de Cultura Económica, Buenos Aires, 2000, 131-134, 149-168.
[19] N. Hellström, Arch. Nat. Hist., **39(2)** (2012) 234-252.
[20] N. Hellström, Arch. Nat. Hist., **38(1)** (2011) 1-17.
[21] E. Scott, *Evolution of Genes and Genomes*, in *Evolution*, D.J. Futuyma (ed.), Sinauer Associates Inc., Massachussets, 2005, 522.
[22] A. Robinson and C. Southgate, Theology and Science, **8(3)** (2010) 286.
[23] H.A. Palma, *Metáforas en la evolución de las ciencias*, Jorge Baudino Ediciones, Buenos Aires, 2004, 301-302.
[24] A. Gheerbrant, *Diccionario de los símbolos*, Herder, Barcelona, 1995, 15-37.
[25] L. Florio, Studia Aloisiana, **4(1)** (2013) 15-27.
[26] P. Ricoeur, *Finitud y culpabilidad*, Taurus, Buenos Aires, 1991, 490.