

## The interaction of science and religion: an update on the conflict

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### ABSTRACT

In this discussion of the interaction between science and religion, I review some evidence for and against the *conflict* thesis to show that there is no inherent contradiction between them, but rather an expected tension. I analyze why it is not desirable or even possible to keep these two cultural forces strictly independent from each other, even though it is important to understand and respect their distinctive elements and methods. I discuss two general approaches to the integration of religion and science and argue why both are doomed to cause more harm than good. Finally, I present a model for dialogue between these disciplines and for the integration of both areas in the life of each individual scientist.

Science and religion are two cultural and intellectual forces that have an enormous impact on our everyday lives. Millions of people complete pilgrimages, care for the sick, and give money away inspired by religion. And millions of people work day after day in laboratories, fields and hospitals finding cures for terrible illnesses, making new energy sources feasible, and producing better crops, inspired by science. It is highly unlikely that any human being has not been touched deeply by one or the other, and a constant competition—if not conflict—would be expected between science, generally accepted to be based upon reason and evidence, and religion, typically assumed to be based upon faith and authority. The collision goes beyond the individual experience: “At least in the contemporary world, science should be viewed not only as a knowledge producer, but as an institution with values, interests and resources that competes with many others, including religion.” (Evans, 2010, p. 221). How fierce or even real is this conflict? Is religion bound to disappear as it is displaced by the progress of science? Echoing the words of Ian Barbour (1997, *Introduction*), what is the place of religion in an age of science? These questions have both an epistemological dimension of general interest, as well as an existential and personal dimension.

In this discussion of the interaction between science and religion, I argue that there is no inherent contradiction between them, but rather an expected tension. I analyze why it is not desirable or even possible to keep these two cultural forces strictly independent from each other, even though it is important to understand and respect their distinctive elements and methods. I discuss two general approaches to the integration of religion and science and argue why both are doomed to cause more harm than good. Finally, I present a model for dialogue between these disciplines and for the honest integration of both areas in the life of each individual scientist.

I write as a researcher who has devoted more than twenty-five years to exercise science but,



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unlike some popular science writers dabbling into philosophy or metaphysics, I do not attempt to shield my ideas behind the claimed objectivity of my scientific discipline or the linguistic ruse of writing in third person: the issues are too close to me to even pretend any neutrality. At the same time, I make an honest effort to understand the topic from a philosophical point of view, although I acknowledge I have not included works that others would consider classics in the discussion about religion and science, such as the writings of Wolfhart Pannenberg or Pierre Teilhard de Chardin. I encourage my readers to make their own contributions to my central argument from those perspectives which I have omitted.

The interaction between religion and science is an extremely wide topic. In an attempt to narrow it down to a manageable breadth, I will focus this discussion on the interaction of religion and the natural sciences, with scant reference to the so-called social sciences such as history, sociology, education, and economy. This decision obeys more to my limited training in the social sciences and their methods, than to an ideological position about their relative importance in the universe of academics. Additionally, I will focus on Christianity, not on religion in general, for three major reasons. First, because it was in the context of Western Christianity that modern science was born and flourished (Henry, 2010; Lindberg, 2010; Principe, 2011). Second, because it is the common approach of many scholars who have addressed the topic in the past two decades (McGrath, 2010). And third, because I am a Christian. Finally, although both science and religion could be discussed as institutions, as cultural forces, as areas of knowledge, or as individual endeavors or experiences, I will refer to them as areas of knowledge (fields of study or disciplines), unless I specifically say otherwise. In the end my focus will be on the individual scientist.

## Different approaches to address the interaction between science and religion

Barbour (1997) uses a fourfold typology for the study of these interactions: *conflict*, *independence*, *dialogue* and *integration*.<sup>1</sup> Other authors have decided to follow this strategy, using slightly modified terminologies: according to Artigas, the classification from the Institute for Hermeneutic and Systematic Research is *convergence*, *conflict*, *complementarity*, and *refusal of the articulation* (Artigas, 2001, p.5), and John Haught's is *conflict*, *contrast*, *contact*, and *confirmation* (Artigas, 2001, p. 6). I will not go into the details of the different terms, but will discuss some major aspects of Barbour's four types (the most widely used typology), in an attempt to summarize and evaluate several key, representative discussions of the interaction between religion and science at the beginning of the twenty-first century.

### Independence

From the scientist's point of view, a natural reaction to a manuscript or presentation on the interaction of science and religion would be: *why bother? Let the scientists focus on science and let the theologians deal with religion. Each to his own.* This is an example of the *independence* approach, which considers each discipline as totally separate from the other and establishes clear boundaries between them. From this approach, science and religion are presented as autonomous and respectable fields of study that use different methods and language to acquire knowledge. Independence gives legitimacy to each discipline while protecting them from harming each other. According to Alister

<sup>1</sup> Apparently, he introduced his typology in 1987 at a meeting organized by the Vatican Observatory of the Catholic Church (Russell, Stoeger, & Coyne, 1997).



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McGrath,

This approach is found in the 1981 policy statement of the National Academy of Science, which declared that 'religion and science are separate and mutually exclusive realms of human thought whose presentation in the same context leads to misunderstanding of both scientific theory and religious belief.' (McGrath, 2010, Chapter 6, Independence, par. 2)

By stepping outside its boundaries, it is possible for either discipline not only to create misunderstanding and conflict, but also to undermine itself. Hence, the best solution would seem to be keeping them as separate, non-overlapping fields.

While this approach is very appealing, there are several reasons why I don't consider it adequate, not the least of which is the fact that there is considerable difficulty when attempting to establish those boundaries. In addition, the approach compartmentalizes reality, while the human experience is one of wholeness and interconnectedness. We have traditionally developed different disciplines to study the various aspects of that reality, but current academic tendencies are in fact in the opposite direction, aiming for inter- and transdisciplinarity. Arguing for the separation of disciplines would be a step backwards.

Even more personally relevant is the fact that I am both a Christian and a scientist. It would not be honest to put my religious convictions in a drawer as I enter the laboratory or the classroom, to pick them up again before leaving, or to ignore my continuous learning of relevant scientific theories as I share my faith with friends and colleagues or when I attend church to worship. In this line of thought, McGrath quotes from page 19 of Charles Coulson's book published in 1958, *Science and the Idea of God* (Cambridge, UK: Cambridge University Press):

Coulson's unitary vision of reality led him to reject any notion of strictly demarcated "scientific" and "religious" domains of reality (...) 'This [separation] is a fatal step to take. For it is to assert that you can plant some sort of hedge in the country of the mind to mark the boundary where a transfer of authority takes place. Its error is twofold. First it presupposes a dichotomy of existence which would be tolerable if no scientist were ever a Christian, and no Christian ever a scientist, but which becomes intolerable while there is one single person owning both allegiances. And second it invites "science" to discover new things and thence gradually to take possession of that which "religion" once held'. (McGrath 2010, Chapter 27, third from last paragraph).

This warning about a dichotomy of existence must be heeded.<sup>2</sup>

Why would this dichotomy become intolerable to me as a person who owns both allegiances?

<sup>2</sup> When Coulson mentions the risk of inviting science to displace religion, he assumes that science is intent on pushing the boundaries, a reasonable concern given that science in his time—and to this day—was making progress at a much faster pace than religion. But if there was no conflict between religion and science, then his concern was unfounded. The conflict issue is discussed later in this article.



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The basic reason is that the Christian faith spills over my scientific endeavors, indeed, over everything I do. That is true for most of us who pursue a non-fragmented life, regardless of our worldview or religion: the way we do business, how we care for our bodies, how we relate to other people, everything is permeated by our faith or lack thereof. In his presentation of science and religion in the writings of C. S. Lewis, Michael Ward states that “As far as Lewis was concerned, it would be a mistake to consider science and religion as two distinct and perhaps discontinuous disciplines.” He goes on to quote from Lewis' *Letters to Malcolm*: “(...) But that whose claims are infinite can have no standing as a department. Either it is an illusion or else our whole life falls under it. We have no non-religious activities; only religious and irreligious.” (Ward, 2013, p. 4). It would seem that, at least at the level of each individual, there must be an integration of religion and science. The necessity and even possibility of *integration* at the institutional or cultural level is a different issue to be discussed later, but the impossibility of *independence* extends beyond each individual into society, as noted by Pope John Paul II:

For the truth of the matter is that the Church and the scientific community will inevitably interact; their options do not include isolation. Christians will inevitably assimilate the prevailing ideas about the world, and today these are deeply shaped by science. The only question is whether they will do this critically or unreflectively, with depth and nuance or with a shallowness that debases the Gospel and leaves us ashamed before history. Scientists, like all human beings, will make decisions upon what ultimately gives meaning and value to their lives and to their work. This they will do well or poorly, with the reflective depth that theological wisdom can help them attain, or with an unconsidered absolutizing of their results beyond their reasonable and proper limits. (Pope John Paul II, 1988, p. M13).

The *independence* approach, therefore, is not adequate because it compartmentalizes the study of human reality, and because it will produce an intellectual schizophrenia in those individuals who are both Christians and scientists. Unless we accept that no Christian should work in science.

Del Ratzsch offers an individual integration perspective in Chapter 9 of his book *Science and its Limits* (Ratzsch, 2000). Is it legitimate for a Christian to work in science? The question might seem unnecessary, but if Christianity and science are incompatible, an answer is mandatory. Without adopting a position yet on the contradiction part, a tentative answer is *yes*, it is legitimate for a Christian individual to work in science, for two major reasons. First, because most occupations are not inherently good or bad, including manual work, law, science and education. “By itself, empirical science will not lead you to God, nor will it take you away from Him” (*Ciencia y fe (Mariano Artigas, profesor de la Universidad de Navarra)*, 2009). By practicing science responsibly—understanding wildlife and caring for it, learning medicine and curing people—I as a Christian can obey God's instructions to be a steward of his creation and to care for the sick, the hungry and the poor. And second, it is legitimate because we are rational beings with the ability to explore and understand the world, because each one has a mind. Ratzsch quotes the Bible to propose we are meant to engage in constant discovery: “It is the glory of God to conceal a matter; to search out a matter is the glory of kings.” (Proverbs 25:2, New International Version). In the New Testament, it says: “Jesus replied: ‘Love the Lord your God with all your heart and with all your soul and with all your mind.’ This is the



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first and greatest commandment.” (Matthew 22:37-38). Intellectually sound scientific work is consistent with “loving God with all your mind”.

Is it acceptable for me as a scientist to be also a Christian? Will not my religious beliefs contaminate my scientific work, given that I reject separating both areas? This leads to the model of conflict, which is also concerned about the possibility of science being inherently in contradiction with Christianity and undermining Christian beliefs.

## Conflict

It could be said that this is the official position in today’s culture, and yet it is a misinformed one. Essentially, the conflict perspective is that these two major areas of knowledge are based upon mutually exclusive foundations and have been perennially at war. The view is promoted by a few vocal scientists who are perceived by the public to speak in the name of science, and exacerbated by the reactions of some Christians to the claims of those scientists. Pushed to its limits, the conflict argument would force me to choose between my Christian faith and my profession as a scientist. Because of its prominence, I will examine the conflict model in order to show that even if it is the prevailing position in popular culture, there are enough counterarguments to suggest that it is neither philosophically nor historically sound.

The claim that science is based upon reason and experience but religion is nothing more than individual beliefs based on superstition is superficially correct and very appealing to a contemporary mentality. Science keeps advancing at a fantastic pace, endowing humans with an ever-increasing capacity to explain and control nature<sup>3</sup>. In addition to notable success, an aura of objectivity and unanimity pushes to establish science as the ultimate authority. Meanwhile, Christianity is perceived by many as faith without evidence, as blind obedience to subjective authority, an outdated cultural element intrinsically opposed to science that is quickly being pushed into a corner from which it will soon disappear. Despite the imprecision of those pervading perspectives, what are some concrete consequences of this clash?

At the dawn of the scientific revolution, when a Copernican heliocentric view of the cosmos was questioning the traditional Ptolemaic (geocentric) position, the major spokesman for the new perspective was Galileo Galilei (1564-1642). Galileo was summoned to Rome in 1633 to be tried by the Holy Office for his *Dialogue Concerning the Two Chief World Systems*, published in 1632. He was condemned and spent the rest of his life under house arrest. This so-called *Galileo Affair* is often presented as evidence of the opposition of Christianity to the advancement of science.

*In Vitro* Fertilization (IVF), stem-cell research, and cloning, illustrate another front where Christianity is perceived to be constantly opposed to science, namely, in bioethics. To a vast majority of people, science means medical progress in the manipulation of nature and the present or future ability to accomplish what was previously impossible, while Christianity clings to tradition and resists change, blocking progress.

<sup>3</sup> The actual accomplishments enabled by this capacity are constantly being questioned on solid grounds, both by philosophy and some of the social sciences. See, as an example, the editorial by Aragón-Vargas (2016).



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Much more widely known are some religious reactions to Darwin's *On the Origin of Species* (1859) and *The Descent of Man* (1871). Widely researched, discussed, refined and contended for over one-and-a-half centuries, evolution states that all forms of life are "... the result of an unguided, unplanned process of random variation and natural selection" (Kansas Evolution Hearings, 2015, *Opposition to new standards*). Darwinian evolution is considered the foundation of modern biology, and it is the official theory taught in all public schools in the United States and I would assume in most of the world. Some core elements of Darwinian evolution challenge what a few Christian traditions consider key interpretations of the Bible (e.g., the creation of the world in six, twenty-four hour days), and certainly some extrapolations of Darwinian evolution challenge what all Christian traditions consider essential elements of Christianity, such as the purpose of human life, God's existence, and the cosmos as the creation work of a personal God. The ingredients for conflict are all there.

As suggestive as the preceding episodes may seem, the conflict model fails upon closer scrutiny. For one thing, historians and other scholars agree that the conflict position is unwarranted, that it is a perception popularized by two books written at the end of the nineteenth century: *History of the Conflict between Religion and Science* (John William Draper, 1874) and *The Warfare of Science with Theology in Christendom* (Andrew Dickson White, 1896). Peter Harrison even calls it 'the conflict myth' (Harrison, 2010, p. 4), and goes on to explain that the historical record does not reveal a model of constant warfare.

Historical analysis does not reveal a consistent, monothematic relationship between religion and science—either antagonistic or synergistic—but it can be readily seen that Christianity was indeed a foundation for modern science in the sixteenth and seventeenth centuries. For instance, it was the work of Christian monks that preserved dozens of important documents during the so-called Dark Ages that preceded the scientific revolution, and the establishment of universities in Bologna, Paris, and Oxford in the twelfth century—with the sponsorship of the Church—fostered an academic stage for the peaceful interaction of Christian theology and the natural sciences (Lindberg, 2010).

A Christian culture provided the foundation for the development of modern science. Joseph Needham, a notable scholar from Cambridge who wrote the Chinese dictionary of technology and studied the history of science in China, posed what is known as Needham's question: considering the amazing technological accomplishments of the Chinese, "Why did modern science, the mathematization of hypotheses about Nature, with all its implications for advanced technology, take its meteoric rise only in the West at the time of Galileo [but] had not developed in Chinese civilisation (or Indian or Islamic)?" («Joseph Needham», 2015). A compelling answer is that this happened because in the East they did not have the concept of one God, creator of the world according to universal laws, while the medieval Christian scholars were committed to the fundamental rationality of the universe, a position strongly argued by Stanley Jaki (Lindberg, 2010, p. 32). This view of the world as a cosmos, an ordered whole governed by principles that can be discovered through reason and observation, is fundamental for the development of science. In the words of Mariano Artigas, "belief in an underlying natural order and in the human ability to know it were factors that contributed to the systematic development of modern empirical science and continue to foster its progress today." (Artigas, 2001, p. 27). As Harrison (2010) points out, it is important to note in this context a recurring pattern in the Western history of science: in many instances, Christian religion provides the foundation for the development of science, and then science eventually seeks to displace religion (p. 7).



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Lindberg concludes his analysis on this topic with a sensible comment:

Thus the story recounted in this chapter is not one of warfare between science and the church. Nor is it a story of unremitting support and approval. Rather, what we find, as we ought to have suspected, is a relationship exhibiting all of the variety and complexity with which we are familiar in other realms of human endeavor – conflict, compromise, accommodation, dialogue, alienation, the making of common cause and the going of separate ways. (Lindberg, 2010, p. 33).

Naturally, a story of perennial conflict and irreconcilable differences is more attractive at a popular level and therefore much better material for the media, but it does not accurately represent the historical reality.

Another reason why saying that science and religion are constantly at odds is misguided, is because the statement can be shown to be fatally oversimplified, conveniently blaming Christianity for any conflict. This can be illustrated by examining in some more (but still far from exhaustive) detail the controversies around the theory of evolution. Jon H. Roberts recently presented an interesting summary entitled *Religious Reactions to Darwin* (Roberts, 2010). One of his major points is that Darwin's evolution not only questioned specific elements in Christianity, but the mere act of questioning was undermining a centuries-long tradition of perceiving science as a discipline that supported the Christian view of a provident, divine creator. By opening the door to conflict, science was suddenly turning from friend to foe. According to Roberts, in the first fifteen years after the publication of *Origin of Species*, a majority of Christian thinkers denounced it as an assault on fundamental principles of religion. Several efforts made at different times over the following twelve decades hurt the credibility of the religious side of the debate: "Some of the arguments that Christian clergy and theologians advanced in an effort to undermine the credibility of Darwin's theory were strained, garbled, uninformed, even silly." (Roberts, 2010, p. 83). Harrison agrees with the assessment, but extends the blame to both sides: "To be sure, the arguments generated by this muscular atheism, like those of many of its religious opponents, have not always been of the first rank." (Harrison, 2010, p. 2). Darwin himself was responsible of adding fuel to the fire by later extending his challenge from the realm of natural theology to questioning the very supremacy of human beings: "In challenging the idea that an immense intellectual, moral and spiritual chasm separated the human species from all other creatures, the *Descent of Man* seemed to question the claim that humans enjoyed a privileged status as beings created in God's image." (Roberts, 2010, p. 85).

The conflict surrounding evolution has resulted in several radical reactions, including ongoing attempts to discredit its scientific basis. It has also caused several attempts to bring the conflicting positions to a better agreement. Interestingly, the adjustments or concessions have regularly come from the side of Christianity, a fact that underscores the generalized public perception that religion is weak and outdated and must eventually yield to the overpowering scientific evidence. Thus, while the conflict has been long and great indeed, the persistent habit within some circles of blaming Christianity for any troubling element is an oversimplification that does not adjust to reality.

The evolution vs. Christianity dynamic highlights two peculiarities of the science-religion



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interaction. First, both forces are extremely diverse and there is a great risk of discussing them without paying enough attention to detail, such as whether we are talking about biology, physics, neuroscience or even metaphysical claims made by scientists, on one hand, and if the position under discussion comes from a particular theologian or is an official statement of a major Christian church, on the other. The public discourse, however, is characterized by this lack of attention to detail, falling into the trap of oversimplification. The other peculiarity is that disagreements between opposing worldviews held by individuals tend to be incorrectly classified as science vs. religion conflicts. More on this point later.

A careful revision of the conflict between Galileo and the Catholic Church<sup>4</sup> reveals another example of oversimplification. Numerous papers and books have been published about the Galileo affair, because of its centrality in a perceived conflict which may not be as straightforward as popularly thought. In the words of historian of science Peter Harrison, “Galileo's trial makes for a good story, but it is not emblematic of a larger historical picture” (Harrison, 2010, p. 4). Moreover, the common interpretation of the story may be biased, depicting a false conflict between science and religion. Christopher Decaen (2012) presents a sound argument to show that this was not an instance of faith and reason at odds, but a case where both sides had important truths to defend while neither side paid enough attention to the other; in the midst of many confounding circumstances, bad decisions were made by both parties. Interestingly, Decaen's position is that Galileo was defending biblical truth, while the Catholic Church was supporting the common position of most scientists at the time:

In short, Rome was reminding the scientist of his own need for logical rigor, while Galileo was upholding the Augustinian openness about the literal meaning of Scripture (...) Both of them defended science and the abilities of natural reason to come to deep truths about nature, while neither of them resisted the Faith or the Magisterium. Both thought of faith and reason as compatible and that any apparent friction was due to human error. The conflict really arose more from Galileo's rash zeal for science and the Church's demands that a scientist's theory be airtight before it is taken seriously by Scripture exegetes. (Decaen, 2012, pp. 16, 25).

Historical bias is apparent if we consider the disproportionate attention paid to the fact that Galileo went to trial and was condemned to house arrest in 1633, living in his villa in Firenze to his natural death at age 77. In contrast, hardly anyone knows that Antoine Laurent Lavoisier was sentenced to death in 1794 by the Revolutionary Tribunal in France at age 51 for his previous role as a tax collector, in spite of his scientific genius, with the argument that the Republic was not in need of wise men. The latter was a clear case of science being suffocated by politics, not religion.

Popular history portrays Galileo as a rebel scientist who was right all along, confronting an extremely conservative Church which was, indeed, being shaken by the Protestant reformation and many other political and social forces. Very few people know, however, that Galileo was wrong about his favorite proof of heliocentrism, namely, that without the Earth both rotating on its axis and orbiting the sun, there would be no tides (cf. Decaen, 2012, pp. 23, 24). Among several pieces of evidence

<sup>4</sup> In this brief analysis, I do not claim at all to present a thorough analysis of Galileo's conflict with the Church. Many actors were involved, including Pope Paul V, Pope Urban VIII, the Holy Office, and Cardinal Robert Bellarmine. I simply present an intriguing argument by Christopher Decaen which looks at some issues not commonly addressed.



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known in his time but intentionally ignored by Galileo were the fact that there are two high and two low tides every twenty-four hours, but his theory predicted only one of each; he also dismissed Kepler's theory:

Any experienced mariner or careful observer, even in Galileo's day, knew that the tide cycles bear some connection to the lunar cycle. Indeed, more than a dozen years before Galileo published the *Dialogue*, Johannes Kepler, another astronomer and friend, proposed a basically accurate theory of the tides associating them exclusively with the position of the Moon, not the Earth's dual motion. (Decaen, 2012, p. 24).

The preceding few paragraphs illustrate a tendency to present the conflict as a collision between Christianity and science, once again an oversimplification of the matter. This interaction is perhaps better represented by *tension* than *conflict*.<sup>5</sup> Naturally, a model of conflict between science and religion makes for a simpler, clearer plot, but there is tension within science and there is tension within Christianity. Tension is essential to progress, it is inherent to the scientific task, and it is common to all human endeavors.

Darwinian evolution, for instance, has not been free from tension *within* the scientific community, as any paleobiologist must readily acknowledge. With radically different characteristics and outcomes, Kettlewell's peppered moth experiment, Dawson's Piltdown Man hoax, the Kennewick man discovery, the Mungo man and lady fossils, and the Monte Verde settlement age are only a handful of examples (Levy, 2010). In fact, most of the original criticisms coming from Christian clergy and theologians "echoed the criticisms that were being made by tough-minded critics of Darwin's work within the scientific community." (Roberts, 2010, p. 82).

Also within Christianity, Darwinian evolution has generated a significant amount of tension over the years. Even Blaauw and Kessler, who argue that there really is harmony between science and Christianity, acknowledge that evolution remains a complicated problem (Blaauw & Kessler, 2009). Risking oversimplification myself, it is important to present a few examples of this tension within Christianity. Roberts' 2010 chapter offers an interesting view of the wide variety of religious reactions to Darwin. For instance, he provides several examples of nineteenth century religious thinkers who found no conflict between Darwin's work and Christianity, while others started pointing out serious disagreements, to the extreme of the denunciation of Darwin as an efficient minister of Satan's, made by Orestes Brownson.

Young Earth Creationists, following a literal reading of the Bible, maintain that the earth was created in its basic form about 6,000 to 10,000 years ago, literally in six, twenty-four hour days, and openly oppose evolutionary thought, while many conservative Protestants have no difficulty with the age of the earth, interpreting the *days* in Genesis chapter one as *indeterminate periods of time*. A more recent movement called Intelligent Design argues that because nature shows many instances of *irreducible complexity*, standard Darwinism runs into serious problems trying to explain them. Intelligent Design<sup>6</sup> does not reject evolution, but rejects the position that evolution has no goal, with all

5 For this article, tension is understood as a healthy, dynamic situation where two or more forces pull in different directions, while conflict is presented as a negative, undesirable situation where the only resolution comes from one of the forces defeating the other.

6 According to the Discovery Institute (<http://www.discovery.org/id/faqs/>), "The theory of intelligent design holds that certain



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the theological implications of a random, purposeless existence (McGrath, 2010, Chapter 5). A similar position is that of evolutionary theism, which sees evolution “as God's chosen method of bringing life into existence from inorganic materials, and creating complexity within life. Whereas Darwinism gives a significant place to random events in the evolutionary process, evolutionary theism sees the process as divinely directed.” (McGrath, 2010, Chapter 5). There seems to be enough tension among these Christian perspectives.

Within the Catholic Church, known to have a more rigid structure and a more clearly defined set of beliefs, it took almost a century after the publication of *Origin of Species* before there was an official pronouncement on evolution<sup>7</sup>. This came from Pope XII's encyclical *Humani Generis* (On Human Origin), which basically stated that the theory of evolution was a serious hypothesis, worthy of investigation and serious study, and therefore not inherently diabolical. However, he seriously warned against recognizing those hypotheses which are supported only by a tentative scientific foundation and which directly or indirectly oppose the doctrine revealed by God; he particularly reaffirmed the unquestionability of the human soul being immediately created by God, an issue that by the very nature of the tools of science was outside its scope; he also denounced polygenism (cf. Pope Pius XII, 1950, #35-37). This position was reasserted and expanded by Pope John Paul II on different, less formal occasions, most famously in his *Message to the Pontifical Academy of Sciences: on Evolution*, where he recognized the scientific progress of evolutionism and made additional warnings about the limits of science, addressing in particular the conception of man, created in the image and likeness of God (Pope John Paul II, 1996). His position was one of openness to the science of evolution, but defining clear limits: “As a result, the theories of evolution which, because of the philosophies which inspire them, regard the spirit either as emerging from the forces of living matter, or as a simple epiphenomenon of that matter, are incompatible with the truth about man.” (Pope John Paul II, 1996, #5). More recently, the situation in the Catholic Church is summarized by Ryland (2012), who quotes Cardinal Schönborn and Pope Benedict XVI as being open to the scientific elements of the theory of evolution but highly critical of its scientific positions, which reject philosophical and theological knowledge as real knowledge, a knowledge that sets limits to the metaphysical speculations made by some scientists.

These examples from evolution illustrate the natural tensions usually found both within religion and science, tensions which weaken the argument about the central conflict being that between science and religion. Rather, it seems that the major conflict lies elsewhere: it is a conflict between worldviews, a conflict that transcends science and transcends Christianity. “The real conflict is between two diametrically opposed worldviews: naturalism and theism.<sup>8</sup> They inevitably collide.” (Lennox, 2009, p. 29). As a Christian and a scientist, I agree with Mariano Artigas that evolution theory is not essentially in contradiction to Christianity, although I think that the evidence for the former is less convincing than

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features of the universe and of living things are best explained by an intelligent cause, not an undirected process such as natural selection.”

<sup>7</sup> Even though there is a plurality of opinions within the Catholic Church, a number of documents or pronouncements from the popes present the official position of the Church on specific matters. While these documents draw from the theological and scientific work of eminent academicians, the final orientation from the highest authorities in the Church confers them this quality of official positions. This document makes reference to them the same way that in science we make reference to correct or incorrect methods, although the scientific community is not unanimous about such methods.

<sup>8</sup> Naturalism, more specifically called metaphysical naturalism, is the perspective that God (a supernatural entity) does not exist because the only things in existence are natural entities. “Naturalism uses empirical science to present metaphysics and religion as meaningless and useless” (Artigas, 2001, p. xviii). Theism, in its multiple expressions, claims that God exists and has different levels of interaction with natural entities. Science is not necessarily naturalist, as religion is not necessarily theist. For this reason, the conflict is not necessarily between science and religion, despite the generalized perception.



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many would like to think:

If we focus on the deepest level of the issue, on the existence of a personal God who is the source of all being and becoming, and also on the existence of spiritual dimensions in the human person who has a unique relationship with God, there cannot be any conflict unless evolution is interpreted in a materialistic way. Some excesses on the part of extremist religious groups that fight against evolution are closely related to contrary excesses of some extremist writers on popular science who interpret evolution as banishing religions; in both cases, however, we are dealing with ideological interpretations both of religion and of science. (Artigas, 2001, p. 117).

In summary, I have attempted to show that there is no inherent antagonism between science and Christianity, even though all the ingredients for creating conflict are present. Hence, the individual is not forced to choose one or the other, as some proponents of scientism would have us believe. To avoid an escalation from natural tension to irreconcilable conflict there is a need for *dialogue* between these two powerful intellectual forces.

## Dialogue

Alister McGrath (2010) offers three overlapping reasons to justify dialogue between these two areas of knowledge. First, he states that neither discipline can give a complete account of reality, regardless of the claims of several representatives on either side; when both voices are heard, a better understanding can be obtained. Second, both disciplines are concerned with explaining the world, although science can be said to focus on the *how* (the mechanisms) while religion addresses the *why* (a search for meaning), complementing each other<sup>9</sup>. And third, science not only successfully answers most of its own questions, but it also raises other questions which it is not equipped to answer without stepping over its own so-jealously-guarded limits, such as exactly when does a human person come into existence. All three reasons revolve around the issue of incompleteness and the need for complementarity.

As part of the celebrations of the 300<sup>th</sup> Anniversary of the publication of Sir Isaac Newton's *Philosophia Naturalis Principia Mathematica* in 1687, Pope John Paul II wrote a letter to Rev. George Coyne, Director of the Vatican Observatory, who led a Study Week to investigate the multiple interactions among philosophy, theology, and the natural sciences. He encouraged dialogue for the benefit of both parts: "Science can purify religion from error and superstition; religion can purify science from idolatry and false absolutes. Each can draw the other into a wider world, a world in which

<sup>9</sup> McGrath, as some other authors, applies to science a reductionism common in scientific naturalism. This perspective of science is present in many writings, possibly resulting in an oversimplification. As an example, social sciences could be considered a middle ground combining elements from natural sciences, philosophy, and religion in their attempt to use empirical methods to understand the meaning of human behavior. Rigorous natural scientists, however, would probably discredit this practice, rejecting its claims of "true science". The discussion is far beyond the scope of this article, but I acknowledge its importance.



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both can flourish.” (John Paul II, 1988, p. M13). In addition to the benefit to both disciplines, I would add that dialogue would definitely help individual Christians and scientists understand our own possibilities and limitations, an extremely important point since we are the ones facing questions and difficulties in our daily lives.

What should this dialogue look like? From the perspective of John Paul II, it must be a dialogue between equals, where both intellectual forces respect one another and each has its own identity:

“This drive is essentially a movement towards the kind of unity which resists homogenization and relishes diversity. (...) The Church does not propose that science should become religion or religion science. On the contrary, unity always presupposes the diversity and the integrity of its elements. Each of these members should become not less itself but more itself in a dynamic interchange, for a unity in which one of the elements is reduced to the other is destructive, false in its promises of harmony, and ruinous of the integrity of its components. We are asked to become one. We are not asked to become each other.” (John Paul II, 1988, pp. M3, M8).”

This is a very appealing proposal, but some authors claim that dialogue is not possible because the differences between science and religion are so radical that we don't even speak the same language. Science is focused on studying the natural world to obtain knowledge that can be subjected to verification. Its method requires experimental control, and it is in principle always open to questioning current truths, to revising current models, when enough evidence points in that direction.<sup>10</sup> Science has been extremely successful because of the very restrictions it has placed on its object of study, but for that very reason it cannot study the spiritual dimension: the existence and nature of God, divine participation in creation, the human soul, or the meaning of life. To address the spiritual aspect of reality, it is necessary for the aims, methods and results of religion to be different from those of science.

John Polkinghorne points out other important differences: science keeps building on what has been previously learned, while theology (a tool used in the religion field) regularly needs to go back to earlier findings; scientists take the initiative to observe or to experiment, while in Christian theology it is God who takes the initiative to reveal himself; in science there is a basic understanding that is common to a large majority of scientists, while in theology there is still considerable fragmentation, as suggested by the wide variety of religions and the many denominations even within Christianity.

One additional difference is nicely pointed out by Ward (2013), who says that scientific claims are necessarily small, but very well said, while religion makes statements of a much wider scope, but more difficult to cash:

The smallness of scientific statements is often obscured by their successfulness (...) The magnificence of such scientific achievements is so huge that it can mislead us into thinking that they have said a great

<sup>10</sup> What exactly is enough evidence is a separate issue beyond the scope of this manuscript, and apparently beyond those philosophers of science who have attempted to reach a consensus on the topic.



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deal, when actually they have said relatively little, but said it very well. A true scientific statement has to be relatively small, because it is only relatively small things that can be said with sufficient univocality to be empirically verifiable or falsifiable (...) Religious statements, by saying things which attempt to explain life in the round, use language which is very hard to quantify, to measure, to test. But that is because they are trying to say a very great deal; they are trying to find the unity, the oneness, the heart of all reality. (Ward, 2013, p. 10).

Despite the differences I have mentioned, and many others I have omitted, both science and religion attempt to make sense of things. They are both concerned with the search for truth (Polkinghorne, 2008, p.1), and both have specific, refined tools that are applied to their subject matter in the search for that truth. They both use models or metaphors, and they are both grounded on evidence even if that evidence is of a different sort.

Dialogue is possible but, since these two areas of knowledge are so different, Mariano Artigas suggests you need philosophical bridges: because science is based on several presuppositions that allow it to exist, and because those presuppositions transcend the specific approaches used in the sciences to fall in the realm of philosophy, which can in turn connect science and theology, the presuppositions are the bridges.<sup>11</sup>

These presuppositions are of three kinds. The first refers to the intelligibility or rationality of nature; it can be labeled as *ontological* and is closely related with the natural order. The second refers to the human ability to know the natural order; it can be labeled as *epistemological* and includes the different forms of scientific argument. The third refers to the values implied by scientific activity itself; it can be labeled as *ethical* and includes the search for truth, rigor, objectivity, intellectual modesty, service to other people, cooperation, and related values. (Artigas, 2001, p. xix).

Specifically, dialogue is possible if it uses Artigas' three presuppositions of science or similar bridges, if both sides remain faithful to the integrity of their disciplines, and if both have a basic understanding and respect for each other. Otherwise it will rather be a contest where each side is constantly attempting to conquer the other. Currently, it seems like Christianity shows much more interest in science than science in Christianity; I do not think this should be interpreted as one of them being “right” and self-sufficient, and the other being “wrong” and in need of external validation. The present dynamic is rather a reflection of the current positive momentum that science enjoys, but increasing interest in the philosophy and the history of science is slowly achieving a better balance. For those of us who are scientists and Christians there is a responsibility to understand both areas of knowledge well and to participate in this dialogue. At the same time, we have an enormous ontological, epistemological and ethical advantage over non-Christians because those presuppositions are not only retrojustified by science, but they have their own foundation in our Faith.

11 For a discussion of some presuppositions of science, see van Woudenberg (2017).



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## Integration

Integration between each individual's religious beliefs—or absence thereof—and science is absolutely necessary to avoid what I previously called *intellectual schizophrenia*. This is not to say that, as a society, integration should be the goal of dialogue. Realizing the impossibility of doing justice to this approach in a short manuscript, I will limit myself to presenting two examples of how some previous attempts at integration have not turned out well, namely, the attempt to use science to prove the existence of God and the effort to provide alternative interpretations of science that are more aligned with a Christian worldview. I will then present what I see as the most promising approach.

The first example revolves around finding God in the study of nature. In the context of a predominantly Christian Western society, it was only natural for individual scientists like Johannes Kepler, Francis Bacon or Isaac Newton to praise God and marvel at his works. “There are many examples of scientists with religious convictions having found confirmation of their faith in the beauty and elegance of the mechanisms their research uncovers.” (Brooke, 2010, p. 109). Two centuries before the scientific revolution, the Society of Jesus (or *Jesuits*, as more commonly known), already had a particular attitude towards science and mathematics, expressed in their motto 'to find God in all things'. From a cultural perspective, the Western worldview was apparently less fragmented than it is now:

When early modern thinkers looked out on the world, they saw a cosmos in the true Greek sense of that word, that is, a well-ordered and arranged whole. They saw the various components of the physical universe tightly interwoven with one another, and joined intimately to human beings and to God. Their world was woven together in a complex web of connections and interdependencies, its every corner filled with purpose and rich with meaning. Thus, for them, studying the world meant not only uncovering and cataloguing facts about its contents, but also revealing its hidden design and silent messages. This perspective contrasts with that of modern scientists, whose increasing specialization reduces their focus to narrow topics of study and objects in isolation, whose methods emphasize dissecting rather than synthesizing approaches, and whose chosen outlooks actively discourage questions of meaning and purpose. Modern approaches have succeeded in revealing vast amounts of knowledge about the physical world, but have also produced a disjointed, fragmented world that can leave human beings feeling alienated and orphaned from the universe. Virtually all early modern natural philosophers operated with a wider, more all-embracing vision of the world, and their motives, questions, and practices flowed from that vision. The concept of a tightly connected and purposeful world derives from many sources, but above all from the two inescapable giants of antiquity, Plato and Aristotle, and from Christian theology. (Principe, 2011, Chapter 2, par. 1, 2).

Again, it was only normal for earlier scientists (or *natural philosophers*, as they were called) in this cultural context to see divine design and providence in the explanations and regularities that they found from studying the world. These scientists enjoyed integration between religion and science, they



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were Christians who searched for God in St. Augustine's two books: the Book of Scripture (the Bible), and the Book of Nature.

Today's culture is more clearly atheistic, or at least agnostic. The contrast between earlier science and today's experience is clear from Lawrence Principe's aggressive statement: "The notion that scientific study, modern or otherwise, requires an atheistic – or what is euphemistically called a 'sceptical' – viewpoint is a 20th-century myth proposed by those who wish science itself to be a religion (usually with themselves as its priestly hierarchy)." (Principe, 2011, Chapter 2, *Religious motivations for scientific investigation*).

It is important to realize that in the earlier context of a Christian culture, Christian faith was grounded on revelation—embodied in the Scripture, the Bible—, theology, tradition, personal experience, and reason. Faith clearly stood on its own and illuminated the scientific pursuits. This comfortable perspective for Christian scientists started to complicate at the end of the seventeenth century, when some people began to realize that scientific theories were susceptible of both theistic and atheistic readings. Mechanistic views, originally presenting God as a great watchmaker who designed an orderly universe and kept it running smoothly, were pushed towards determinism, materialism, and atheism. The naturally integrated world was starting to fall apart. The default scenario no longer included God, and finding God in the study of nature turned into trying to prove his existence in the midst of hostility from science.

Two different ways back to integration have been taken by Christian thinkers and leaders who understand the importance of science for society but fail to understand its dynamics: the holes-in-the-science approach, and the irrefutable-scientific-evidence approach. The former was commonly used by some Christian writers during the first half of the twentieth century: they looked for gaps in scientific knowledge to find a need for God as an explanation. It is a puzzling strategy, considering that already in the first century A.D., Lucretius had used a similar approach but in the opposite direction: "if the effects commonly ascribed to the gods are in fact explicable in natural terms, then the gods are out of a job" (McGrew, Alspector-Kelly, & Allhoff, 2009, p. 14). Lucretius' argument made the holes-in-the-science approach particularly vulnerable as science progressed with overwhelming speed, painfully updating a phrase written about much earlier periods: "The religious beliefs of antiquity irreversibly lost their credibility as scientific cosmologies progressively embarrassed them." (Brooke, 2010, p. 104). Today, the expression *God-of-the-gaps* is used mostly by atheists and agnostics to—mistakenly—ridicule Christian beliefs.

On the other hand, the irrefutable-scientific-evidence approach takes concrete scientific findings to argue for the necessary existence of God. This approach is illustrated by the concept of the *fine tuning* of the universe: scientists, and particularly physicists, have been able to identify many fundamental constants which must be exactly what they are, or life (as we know it) would not be possible (according to the current understanding). For instance, Paul Davies has calculated that the ratio of the nuclear strong force to the electromagnetic force could not have been different by 1 part in  $10^{16}$ , or no stars could have formed (Lennox, 2009, pp. 69-73). The fine-tuning of all those constants demands an explanation, and many Christians argue that the explanation must be God. This approach is also vulnerable, for several reasons. First of all, scientists are not unanimous on the values of those constants, because of the methods and presuppositions used in their calculation. Second, scientific findings are always open to being challenged and refined, potentially resulting in a different theory



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altogether. And third, fine-tuning does not *necessarily* point to a personal God. After all, isn't the probability of things being the way they are exactly 1.0?<sup>12</sup> I will come back to the necessity of God as a personal creator later. Meanwhile, both the holes-in-the-science approach, and the irrefutable-scientific-evidence approach seem to be weak and inadequate.

The third strategy, the effort to provide alternative interpretations of science that are more aligned with a Christian worldview, takes me back to Darwin. In an account of several movements organized around defeating Darwinian evolution, historian of science Ronald Numbers points out several cases in the United States (e.g., the Religion and Science Association, the Deluge Geology Society, the American Scientific Association, and the Creation Research Society) where good, solid scientists who were also men of faith carelessly mixed religion and science in different “creationist” versions (Numbers, 2010). Their well-intentioned attempts to influence society by providing alternative perspectives based on science have typically been considered not rigorous enough, causing all kinds of problems such as the scientific community's contempt for anything even close to creationism. “As one frustrated anti-evolutionist observed in the 1930s, fundamentalists were ‘all mixed up between geological ages, Flood geology and ruin, believing all at once, endorsing all at once’. How, he wondered, could evangelical Christians possibly turn the world against evolution if they themselves could not even agree on the meaning of Genesis 1?” (Numbers, 2010, p. 130).

A more recent movement known as Intelligent Design has had the immense task of gaining credibility while carrying the burden of being associated by most scientists, correctly or incorrectly, with creationism and all its scientific weaknesses. Proponents of intelligent design theory have given a new twist to William Paley's watchmaker analogy. They offer more solid examples of irreducible complexity, a level of organization and function in systems composed of many interacting parts where the removal of any of them would cause the system to effectively cease functioning. Biochemist Michael Behe, a prominent proponent of this view, confidently declares that “no irreducibly complex system can be produced directly (that is, by continuously improving the initial function, which continues to work by the same mechanism) by slight, successive modifications of a precursor system, because any precursor to an irreducibly complex system that is missing a part, is by definition non-functional” (Behe, 1996, p. 39). According to Intelligent Design Theory, irreducible complexity necessarily involves design—and a designer. This brings us back to the efforts to prove the existence of God.

The common denominator to these two and many other examples that I could mention seems to be a scientist or group of scientists who are also Christians and who get carried away by what they see as positive potential theological implications of new scientific discoveries or gaps in scientific knowledge. I trust that the examples I have chosen illustrate that this is not a good approach, because it tends to run into significant problems. “In sophisticated accounts of the origins of modern atheism it is recognized that where Christian apologists relied on a science-based natural theology to secure the rationality of belief, their efforts often backfired either by inviting an atheistic response or by depending, damagingly, on obsolescent theories.” (Brooke, 2010, p. 119). But more importantly, from the Christian perspective, it is not a good approach because it attempts to build the Faith on the wrong foundations.

12 What I refer to is the fact that regardless of how extremely unlikely something might have been *a priori*, once it happened, it definitely happened: it becomes a fact.



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Most philosophers agree that it is not possible to scientifically prove the existence—or non-existence—of God, and I would like to add that, from a Christian perspective, it *must* be that way. On one hand, as already explained, science has explicitly restricted its object of study to the physical, natural world, a self-limitation which explicitly forbids it from dealing with the supernatural. And on the other hand, an absolute, compelling proof of the existence of God that would force every reasoning human to his knees would be contrary to one of the essential elements of Christianity, namely, the freedom to believe in God and love him. Rather than looking for science to provide coercive logical necessity, the Christian religion needs to go back to building Faith on the revelation found in the Bible, on theology, on the tradition of the Church, on personal experience, on prayer, and on reason. Science can then offer insight to the person who is already a Christian believer: “Theologians following these principles contemplate arguments such as the fine-tuning of the universe as compatible, coherent, or consonant with theism, and not as real proofs of it.” (Artigas, 2001, p. 19). This is a position shared by other writers (McGrath, 2010, chap. 33; Van Woudenberg, 2008, p. 21). By integrating science and religion in this manner, I conclude that science is neither an obstacle for my Christian faith nor the foundation for it. Going back to Pope John Paul II and his 1988 letter:

“Both religion and science must preserve their autonomy and their distinctiveness. Religion is not founded on science nor is science an extension of religion. Each should possess its own principles, its pattern of procedures, its diversities of interpretation and its own conclusions. *Christianity possesses the source of its justification within itself and does not expect science to constitute its primary apologetic.*” (John Paul II, 1988, pp. M8-M9; emphasis mine).

## My proposal for managing the interaction of science and religion

I have used Ian Barbour's four types to study the religion and science interaction. From the *independence* approach, I concluded that the attempt to keep the natural sciences and Christianity totally separate is neither possible nor desirable. The major contribution of this approach lies in its effort to recognize in each discipline its distinctive elements and methods, which are an essential basis for a fruitful dialogue and a cogent integration. By studying the *conflict* approach, I identified simplifications and distortions in popular accounts of the history of science, concluding that there is no inherent contradiction between science and Christianity, but between two general worldviews called naturalism and theism. This recognition isolates the problem and opens the doors for dialogue and integration.

In my brief analysis of two *integration* efforts I criticized them for giving up their religious foundations and attempting to build the Christian faith on scientific grounds, an approach that runs a high risk of embarrassing the religious side and of giving the scientists a reason to distance themselves from Christianity. The model I recommended for integration looked more like a respectful *dialogue*, where both religion and science have important contributions to make. Dialogue is possible despite the wide gap between these areas of knowledge, thanks to the bridge of philosophical reflection proposed by Mariano Artigas (2001): by considering the ontological, epistemological and ethical presuppositions of science, philosophy can bring together science and theology. Artigas's model for the interaction of science and religion is compelling and always valid, because the progress of science, instead of turning



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his perspective obsolete, will rather show that its presuppositions are valid. Progress will not only retrojustify, but also enlarge and refine the presuppositions of science.

In this dialogue, Christianity should not be afraid of any scientific discovery, because if the world was created by God then scientific discoveries can only show us what God has created. In the words of Pope John Paul II's encyclical *Fides et Ratio* (Faith and Reason): “Faith therefore has no fear of reason, but seeks it out and has trust in it.” (Pope John Paul II, 1998, #43)<sup>13</sup>. It is the practical applications and the metaphysical extrapolations of those scientific discoveries that are of great concern, because of the power that they have to heal or to kill, to free or to enslave, to reveal the truth or to deceive. These applications and extrapolations cannot depend on empirical science alone, but there must be room for input from other legitimate sources of knowledge, including Christian theology.

In my particular case as both a Christian and a scientist, I confirm that I stand on solid ground. I have a personal responsibility to illuminate my scientific work with the Christian perspective, and to reinforce my Faith with scientific knowledge. When facing apparent contradictions, I know that tension is an essential part of all human endeavor, including science, and I can legitimately turn to philosophy and theology for clarification. Furthermore, I can join all those scientists who for centuries have found in God an inspiration for their work:

The scientific enterprise acquires a completely new and fascinating meaning when we see it as a task that God has entrusted to us so that we may increasingly participate in his knowledge and mastery over the natural world. Then, cultivating science becomes a human task with divine meaning, and it should be carried out with a deep gratefulness and respect toward the plans of the Creator. (Artigas, 2001, p. 248).

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<sup>13</sup> This is another example of an official document from the Catholic Church where the intention or the guidance of the Church is presented, in this particular case regarding the interaction between faith and reason in the life of each believer.



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