

# AWARENESS OF PAPAL STATEMENTS AND EVOLUTION ACCEPTANCE AMONG BRAZILIAN CATHOLIC SEMINARIANS

by *Marcio Antonio Campos*

*Abstract.* The current generation of Catholic seminarians is among the first ones to be trained to priesthood in a fully digital age, with unlimited access to sources for news, research, and controversies about science and religion, including the one opposing creationism and Darwinian evolution, despite favorable statements on evolution by twentieth and twenty-first century Popes. This article presents an online survey conducted in 2019 among 229 Brazilian seminarians; 48 percent of them espoused evolutionary views (below the average of Brazilians, and Brazilian Catholics, polled in 2010 and 2014), while 55.9 percent considered evolution partially or fully compatible with Catholicism. Favorable views on evolution were more frequent among seminarians with a higher knowledge of the theory, and among those aware of papal statements on the subject, although it is not certain whether such awareness is the reason for a higher acceptance of evolution. Establishing relations of causation, which requires further research, can give evolution advocates a valuable tool to improve its acceptance among Catholics.

*Keywords:* Brazil; Catholicism; creationism; evolution; Intelligent Design; monogenism; original sin; popes; seminarians; theological anthropology

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## INTRODUCTION

Brazilian Catholic seminarians today, future leaders of the Catholic Church in Brazil, are among the first generations of seminarians being prepared for the priesthood in a fully digital age, with an unlimited access to resources beyond those of their seminary libraries, like websites and blogs, online books and courses, and news outlets. Given the growing relevance of the relationship and dialogue between science and religion in the contemporary world—especially since the rise of the New Atheism,

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which claims that modern science has made belief in God irrational, or at least irrelevant (Dawkins 2006; Stenger 2007)—the education of Catholic seminarians in science and faith subjects—including how evolution relates with the concept of a universe created by God—has become crucial. Thus, new seminarians become a most interesting group to survey, instead of priests or bishops, about the relationship between science and religion, especially regarding controversial issues like Darwinian evolution. This article presents the results of an online survey measuring how future priests perceive the relationship between science and faith, evaluating in particular their acceptance of Darwinian evolution both as true and as compatible with Catholic teaching.

Science and religion controversies are not new to the Catholic Church and, having learnt the lesson from the Galileo affair (Fantoli 2008), the Church proceeded more carefully when facing another major scientific breakthrough (Klumpenhauer 2011): it took almost a whole century after the publication of Charles Darwin's *On the Origin of Species* before issuing a broad evaluation of evolutionary biology. Until 1950, the Vatican adopted the approach of dealing with individual texts submitted to the analysis of the Holy Office (Artigas, Glick, and Martínez 2006). The first attempts of establishing whether evolution was compatible with Catholic teaching, made in the final quarter of the nineteenth century and in the first decades of the twentieth century, were badly received by religious authorities, but the lack of authoritative statements by pontiffs, and the fact that Holy Office condemnations did not inform the reasons why a certain book was placed in the *Index of Prohibited Books*, gave Catholic evolutionists some freedom to keep working on the issue (Blancke 2013).

Vatican authorities, at first alarmed by early associations of evolution by means of natural selection with atheism and materialism, eventually started displaying more tolerance toward Darwin's theory, culminating with Pope Pius XII's encyclical *Humani Generis* (1950, §36–37). The pontiff acknowledged the possibility that the human body could have evolved from “pre-existent and living matter”, with two remarks: (1) science had nothing to say about the origin of the human soul and (2) Catholics were required to believe in monogenism, the descent of all mankind from a single, real couple. More recently, Popes John Paul II, Benedict XVI, and Francis have argued that there is no contradiction between Catholic faith and evolution. This conciliation, however, is only possible as long as evolution is understood as the scientific theory, and not the materialistic worldview often attached to it that denies any purpose or meaning in nature and biological processes (John Paul II 1996; Benedict XVI 2007; Benedict XVI 2008b; Francis 2014).

The Catholic world remains, however, a battlefield in the so-called “evolution wars”, with controversy reaching the top of the Catholic hierarchy.

An op-ed article in *The New York Times* by Cardinal Christoph Schönborn, archbishop of Vienna (Schönborn 2005), former student and close friend of Pope Benedict XVI, and general editor of the *Catechism of the Catholic Church*, was widely seen as an endorsement of Intelligent Design (ID) theories, and was heavily criticized by Catholic and non-Catholic theologians and scientists alike. Two days after the publication of the article, Dean and Goodstein (2005) reported links between the piece and the Discovery Institute, the world-leading ID think tank. After the firestorm, Schönborn's monthly lectures at the cathedral of Vienna were dedicated to the theme of creation, and recollected into a book (Schönborn 2007). In these lectures, the Cardinal avoided endorsing any specific theory on origins, limiting himself to a critic of young-Earth creationism (Schönborn 2007, 37–38), and echoing papal statements that accept evolutionary science as compatible with the Catholic faith, while rejecting atheistic and materialistic interpretations of evolution, filed under the expression “neo-Darwinism” (although the word is more widely known as a synonym for the “Modern Synthesis” of evolutionary theory, which has no relation to the meaning Schönborn attributed to it). Benedict XVI also decided to turn the creation-evolution debate into the subject of the 2006 conference of the *Schülerkreis*, the circle of Benedict's former students, including Schönborn (Horn and Wiederhofer 2008).

Away from theological discussions and Vatican meetings, Brazilian Catholics became entangled with the evolution controversy in a different way. The increase of evangelical Protestantism as share of Brazilian population—from 6.6 percent in 1980 to 22.2 percent in 2010, according to Brazilian government bureau of statistics (IBGE), the Brazilian government bureau of statistics—led to the rise of the antievolution narratives (Dorvillé and Teixeira 2015), making Brazil the South American country where creationism found the best environment to grow (Numbers 2009, 221). In a Datafolha poll conducted in 2010, 25 percent of respondents answered that “God created human beings pretty much in their present form at one time within the last 10,000 years or so”—that was the answer chosen by 24 percent of Catholics and 30 percent of Evangelicals (Datafolha 2010; Schwartzman 2010). In 2014, a Pew Research Center survey found similar levels of support for creationism: 29 percent of respondents said that “humans and other living things have existed in their present form since the beginning of time” (Pew Research Center 2014); 27 percent of Catholics and 35 percent of Protestants chose this option.

The Brazilian Society of Intelligent Design (TDI Brasil) was founded in 2014, and ID became a major player in the evolution controversy in Brazil in 2017, when the Discovery Institute and the Presbyterian University Mackenzie set up a research group, featuring Michael Behe (who is Catholic) as a speaker at the opening event. In early 2020, a former president of Mackenzie University and proponent of ID was appointed as head

of the Brazilian government office that oversees *stricto sensu* postgraduate courses nationwide (he was replaced in April 2021). Brazilian Catholics find themselves, then, trapped between the growth of creationism and ID, and the “new atheist” claims that still associate evolution with atheism, a rhetoric trap that drifts religious people away from accepting evolution (Spencer and Alexander 2009, 36–45; Barnes et al. 2020).

Past surveys and polls about evolution have shown that many factors, like religiosity or political preferences, can influence the acceptance of evolution. The survey presented in this article tested two predictors for such acceptance. First, knowledge of what the theory of evolution is and how it works. This is a widely tested predictor, with mixed results: while some studies find a correlation between higher levels of evolution knowledge and acceptance (Rutledge and Warden 2000; Barone, Petto, and Campbell 2014; Weisberg et al. 2018), others do not (Bishop and Anderson 1990; Sinatra et al. 2003). Some of these studies were carried with specific groups, and this survey tests whether there is a link between knowledge of evolution by Catholic seminarians and its acceptance both as true and as compatible with the teachings of the Catholic Church. The main goal, however, was testing a second predictor, namely, whether seminarians who know what a Pope has said or written about evolution are more likely to accept it as true and/or compatible with Catholic doctrine, given the weight of papal authority among Catholics, even if such favorable statements on evolution—including those made in encyclicals, considered part of the so-called Ordinary Magisterium—are not binding or considered infallible. The establishment of such a relation between evolution acceptance and awareness of papal statements on the subject could open a new door for evolution advocates interested in increasing its acceptance among Catholics, both clergy and laity.

#### METHODOLOGY

The author contacted rectors, deans, and professors of 260 major Catholic seminaries in Brazil by e-mail in March 2019 requesting an online questionnaire to be circulated among seminarians; second and third rounds of online invitations were made in April and May; the most important seminaries (e.g., those located in state capitals) were contacted by phone as well. Every contact included a presentation of the author and the survey, as well as mentions to a similar survey carried by the same author in 2011, with a different group of seminarians (Campos 2013). To avoid concerns about privacy, no personal or contact data were required from the respondents.

The questionnaire received 229 answers between early March and early June 2019 from seminarians located in 16 Brazilian states and the Federal District—an increase of 60 percent compared to the 2011 survey, which was answered by 143 seminarians from 10 states and the Federal District.

According to the *Statistical Yearbook of the Church 2019* (Secretariat of State 2021, 265), there were 8,041 major seminarians, both diocesan and religious, in Brazil in the end of 2019. The survey respondents, therefore, account for around 3 percent of all Brazilian seminarians. Considering a confidence level of 95 percent, the margin of error for the survey is roughly 6 percentage points.

The survey had three parts; the first one included profile information: location of the seminary, whether it was run by a diocese or by a religious order or nondiocesan institutions, year of formation, proficiency in foreign languages, and previous degrees. A second part dealt with general views on science and religion, with questions identical to the 2011 questionnaire, allowing for comparison between surveys. Results obtained from these questions, however, are not the object of this article, which will focus on the final part of the questionnaire, where seminarians were asked about their views on Charles Darwin's theory of evolution. A pair of questions examined whether seminarians think evolution is *true*, and whether evolution is *compatible* or *opposed to Catholic teaching*. To measure acceptance of evolution as true, a multiple-choice question covered the most popular views on the subject, including young-Earth creationism, ID (both not mentioned by name, however), and two views on evolution: one that includes divine guidance (sometimes called "theistic evolution") and an option that does not account for divine participation in the evolution process. Additional choices included one for those who have no view on the origin of diversity of life on Earth, and another one for respondents whose actual views on origins were not covered by any of the alternatives previously offered.

The question on compatibility between evolution and Catholic doctrine used a 4-point Likert scale plus an "I don't know" option; respondents who claimed evolution was "totally opposed" or "more opposed than compatible" with Catholic teaching were invited to write down their objections to evolution in an optional, open answer question. An additional question presented a set of statements about evolution and religion, including some claims commonly made by evolution critics or adherents; seminarians were asked whether they agreed or disagreed with them, once again using a 4-point Likert scale plus an "I don't know" option. The survey also included two questions on compatibility with Catholic teaching involving creationism and ID, using a 4-point Likert scale plus "I don't know" and "I don't know what creationism/Intelligent Design says" options.

The survey tested two hypotheses regarding predictors of evolution acceptance (both as true and as compatible with Catholic teaching) among seminarians. The first predictor was knowledge of evolution. The survey included two ways of measuring such knowledge: self-declaration and a short test with seven sentences about evolution in a "true/false" model, which resulted in an "evolution score" ranging from 0 to 7 for each

respondent, depending on the number of correct answers. Due to some heavy discrepancies between the self-declaration and the “evolution score” of many respondents (e.g., seminarians declaring to know evolution “very well” scoring below 3, and seminarians claiming to know “very little” of evolution scoring 5, 6, and even 7), I have decided to consider only the “evolution score” for survey results and discussion purposes.

The second predictor was knowledge of what Popes have said or written about evolution. An open answer question asked seminarians whether they knew of any papal statement mentioning evolution. “Accurate” answers were those with an exact mention of source or content—for example, both “John Paul II’s message to the Pontifical Academy of Sciences in 1996” or “Pope Francis said that ‘God is not a magician with a magic wand’” would count as “accurate” answers. “Wrong” or “inaccurate” answers were those mentioning some writing or speech that did not mention evolution by a Pope who actually spoke or wrote about evolution. Finally, “generic” answers were those that mentioned a Pope who has spoken or written about evolution but without mentioning any specific writing.

Two cases involving very brief mentions of evolution in papal encyclicals deserved a more subjective evaluation. In *Fides et Ratio*, Pope John Paul II wrote that “in his Encyclical Letter *Humani Generis*, Pope Pius XII warned against mistaken interpretations linked to evolutionism, existentialism and historicism” (John Paul II 1998, § 54). In *Laudato Si’*, Pope Francis wrote that “although change is part of the working of complex systems, the speed with which human activity has developed contrasts with the naturally slow pace of biological evolution” (Francis 2015, § 18). Mentions to *Fides et Ratio* were considered as “wrong/inaccurate” since the text was not a statement on the theory of evolution *per se*, but only a recapitulation of what a predecessor had said about erroneous philosophical ideas. *Laudato Si’*, on the other hand, was considered a “correct” mention because it can be read as an acknowledgment of the fact of evolution, albeit subtle—so subtle that it did not receive any press coverage, at least in the United Kingdom (Riley 2019).

I have decided not to discard “wrong/inaccurate” and “generic” answers because both categories show a certain degree of awareness about evolution being mentioned by a pontiff, even if the seminarian was not able to provide a correct reference or quote. For each Pope mentioned (Pius XII, John Paul II, Benedict XVI, and Francis), respondents were then categorized in four groups: first, those who had not mentioned a Pope; then, a group including all those who gave “generic”, “wrong/inaccurate”, and “accurate” answers; this second group was narrowed down to a third one including only respondents with “wrong/inaccurate” and “accurate” answers; finally, this group was narrowed down to a fourth group only with seminarians who provided “accurate” answers. Evolution acceptance was measured for each of these four groups.

**Table 1.** Which of the following statements better describes your view on the causes for the diversity of life on Earth?

God created the universe 6,000 years ago and made all animal and vegetal species in their present form	3.5%
God created the universe billions of years ago and intervened many times to create certain features of living beings that could not have evolved by themselves	15.7%
God created the universe billions of years ago and also created the laws of evolution, guiding evolutionary processes but without direct interference in species' features	31.4%
God created the universe billions of years ago, and evolutionary processes, by themselves, created the current diversity of living beings	16.6%
None of these statements describes correctly my view on the origins of the diversity of life on Earth	25.8%
I have no opinion on this subject	7%

Source: Survey data.

## RESULTS

### *Respondents' Profile*

With few exceptions, respondents are evenly distributed according to formation year (see Supporting Information, Table S1). Almost six in ten respondents (137, or 59.8 percent) claimed to be able to understand foreign languages, with Spanish being the most mentioned one (120 respondents), followed by English (56), and Italian (44). More than four in ten respondents (98, or 42.8 percent) have at least started studying for an undergraduate or graduate degree other than Philosophy or Theology—51 of them earned their degrees, while 47 either left their studies unfinished or are still doing them simultaneously with their seminary duties. The most mentioned area was business administration (13), followed by law (10), and various types of engineering (9). Considering only natural sciences, respondents included one PhD in physics, one MSc in zootechnics, and four undergraduates in biomedicine, biology, physics, and mathematics; four other respondents had not concluded their undergraduate degrees in biology, mathematics (one respondent each), and chemistry (two respondents).

### *Views on Evolution*

Tables 1 and 2 show seminarians' answers regarding their acceptance of evolution as true, and their perception of compatibility between evolution and Catholic doctrine, with an increase in favorability regarding such compatibility in comparison with the 2011 survey (Campos 2013). Not surprisingly, there is a good degree of overlap in the groups: those who

**Table 2.** How compatible is evolution with Catholic doctrine?

	2011 <sup>a</sup>	2019
Fully compatible with doctrine	7%	13.1%
More compatible than opposed	32.2%	42.8%
More opposed than compatible	26.6%	24.9%
Totally opposed to doctrine	19.6%	7%
I don't know	13.3%	12.2%

Source: Survey data; Campos 2013.

<sup>a</sup>Two respondents did not answer this question, which was not mandatory in the 2011 survey. The 2011 survey was answered by a different group of seminarians.

accept evolution as true are more likely to consider it compatible with Catholic teaching, and vice versa; the same happens with those with creationist views, more likely to consider evolution opposed to Catholic doctrine (see Supporting Information, Figures S1 and S2). Seminarians also displayed mostly favorable views about some sentences relating evolution and religion (see Supporting Information, Figure S3).

*Knowledge of Evolution and Acceptance of Evolution and Compatibility with Catholic Teaching*

When asked where and when they had learnt about evolution, most seminarians (78.6 percent) mentioned high school; 51.5 percent mentioned elementary school; 48 percent mentioned newspapers, magazines, books, and documentaries; 24.9 percent mentioned the seminary; 22.7 percent mentioned university studies outside the seminary; and 2.6 percent said they had never learnt about evolution. Results from the self-declaration question on evolution knowledge and from the short evolution knowledge test are in the Supporting Information, Tables S2 and S3, and Figure S4—as previously stated, only the evolution test results will be used in further results and analysis. Seminarians with a higher knowledge of evolution (measured according to the “evolution score”) are more likely to consider evolution both true (either in its “God-guided” or “non-guided” forms) and compatible with Catholic teaching (see Supporting Information, Figures S5 and S6).

*Awareness of Papal Statements on Evolution and Acceptance of Evolution and Compatibility with Catholic Teaching*

Even when considering “generic” or “wrong/inaccurate” mentions, only a minority of seminarians was aware of occasions when a Pope wrote or spoke about evolution (Table 3). Those who did, however, reported greater



**Table 3.** Would you be able to mention any papal document, writing or speech that mentions, even *en passant*, the Theory of Evolution? (Number of respondents)

	Did not mention the Pope	“Generic” mention	“Wrong/inaccurate” mention	Accurate mention
Pius XII	191	4	0	34
John Paul II	198	9	15	7
Benedict XVI	216	10	3	0
Francis	193	8	3	25

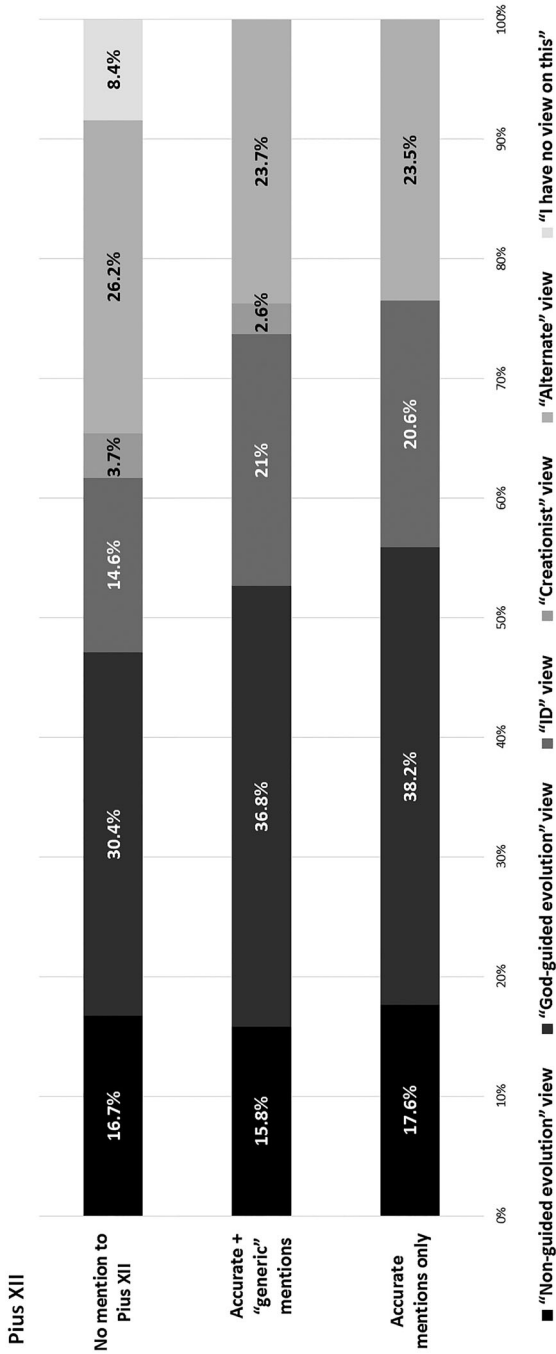
Source: Survey data.

levels of acceptance of evolution both as true (Figures 1 to 4) and as compatible with Catholic doctrine (Figures 5 to 8).

### *Objections to Evolution*

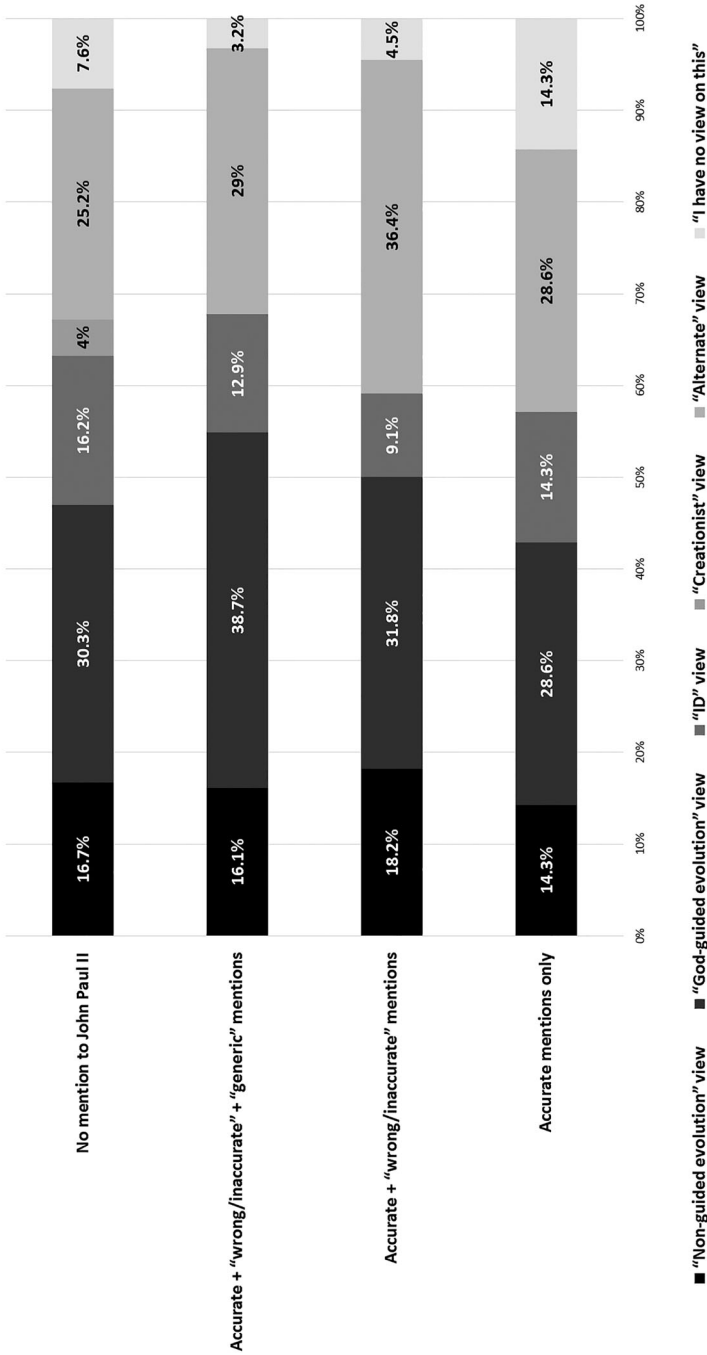
Of the 73 seminarians (31.9 percent of all respondents) who claimed evolution was “totally opposed” or “more opposed than compatible” with Catholic doctrine, 42 explained the reasons behind their choices, and the most frequent objection to the compatibility between evolution and Catholic teaching regarded the origin of mankind (15 mentions). Other issues brought by seminarians were controversies about the origin of life, the belief that the Catholic Church endorses creationism, the belief that evolution excludes divine creation, the doctrine of Fall (the belief that, after the original act of disobedience by Adam and Eve narrated in Genesis 3, human nature became “fallen”, away from God, and such nature was transmitted to the whole humankind), and the randomness of some evolutionary processes. Some of the most elaborate answers are reproduced below:

- “The conflict points are the theory of an only ancestor to all living beings and the lack of an organising principle” (third year of Theology; scored 5/7 at the “evolution knowledge test”; thinks evolution is “totally opposed” to Catholicism; knows *Humani Generis*).
- “Evolution can exist, because it’s something inherent to each being’s nature. But claiming that man came from another being is denying God’s creative goodness” (first year of Theology; 4/7; thinks evolution is “more opposed than compatible” with Catholicism).
- “Evolution takes away God’s role in creation and denies dogma like the Fall as the cause of man’s decay and imperfections” (third year of Philosophy; 6/7; thinks evolution is “more opposed than compatible” with Catholicism; knows *Humani Generis*).

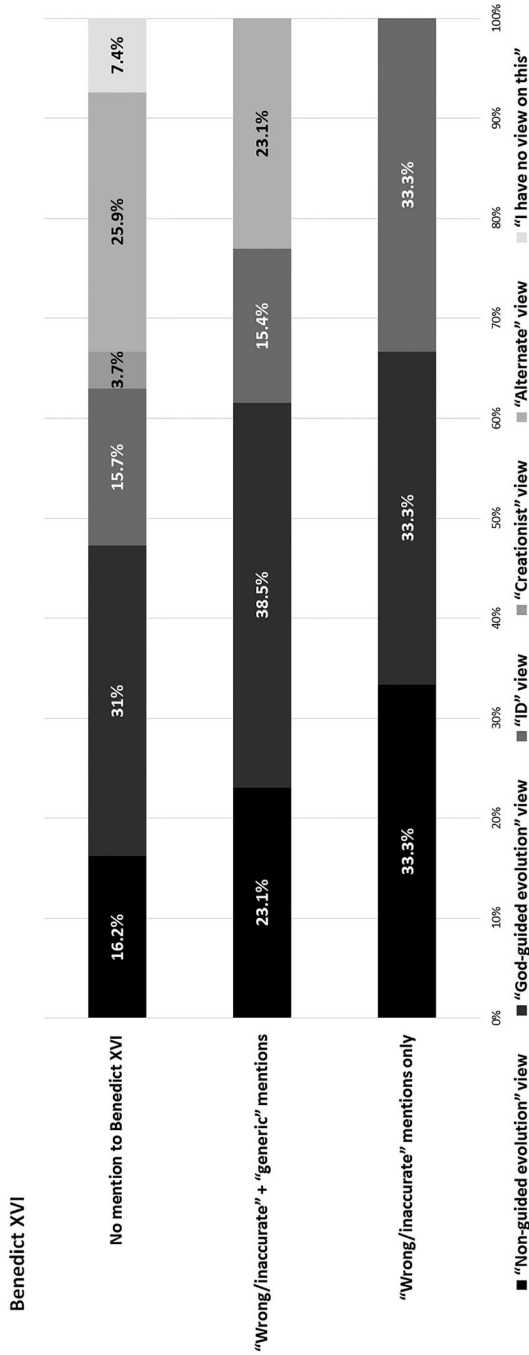


**Figure 1.** Evolution acceptance according to awareness of papal statements on evolution: Pius XII.  
Source: Survey data.

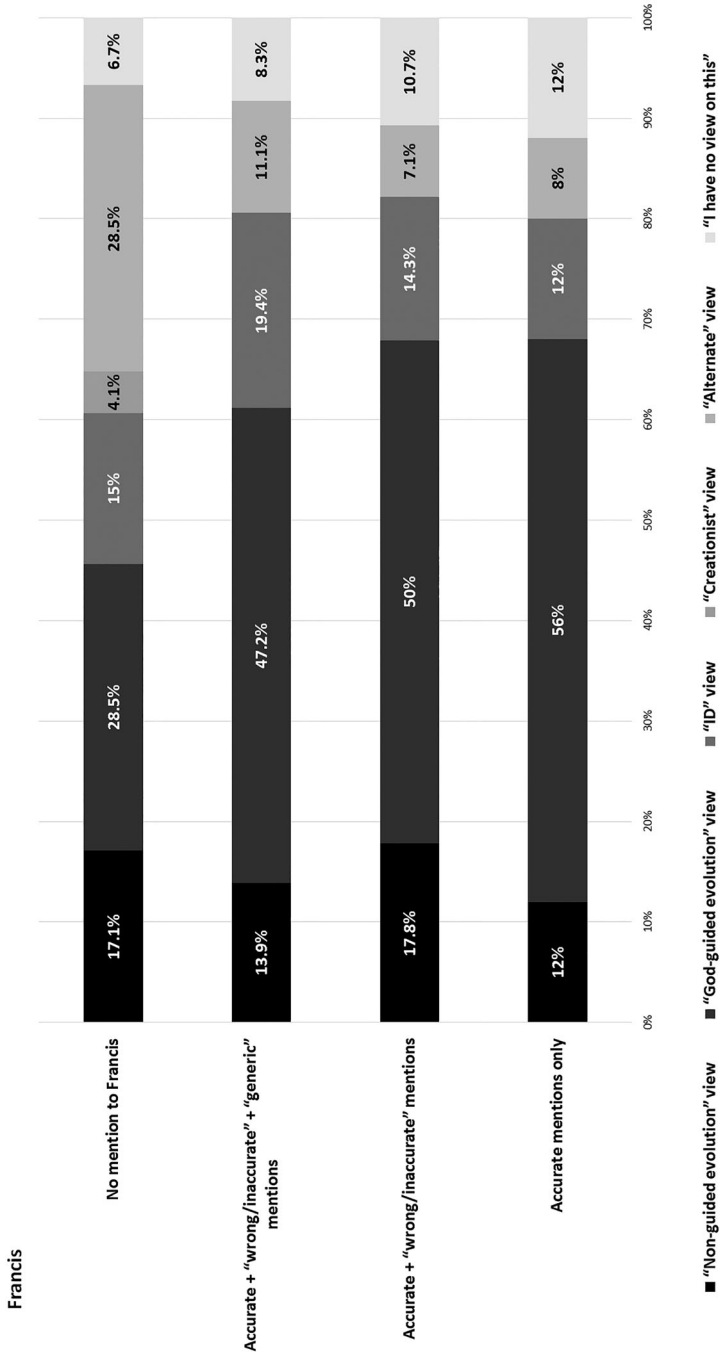
John Paul II



**Figure 2.** Evolution acceptance according to awareness of papal statements on evolution: John Paul II.  
Source: Survey data.



**Figure 3.** Evolution acceptance according to awareness of papal statements on evolution: Benedict XVI.  
Source: Survey data.



**Figure 4.** Evolution acceptance according to awareness of papal statements on evolution: Francis.  
Source: Survey data.

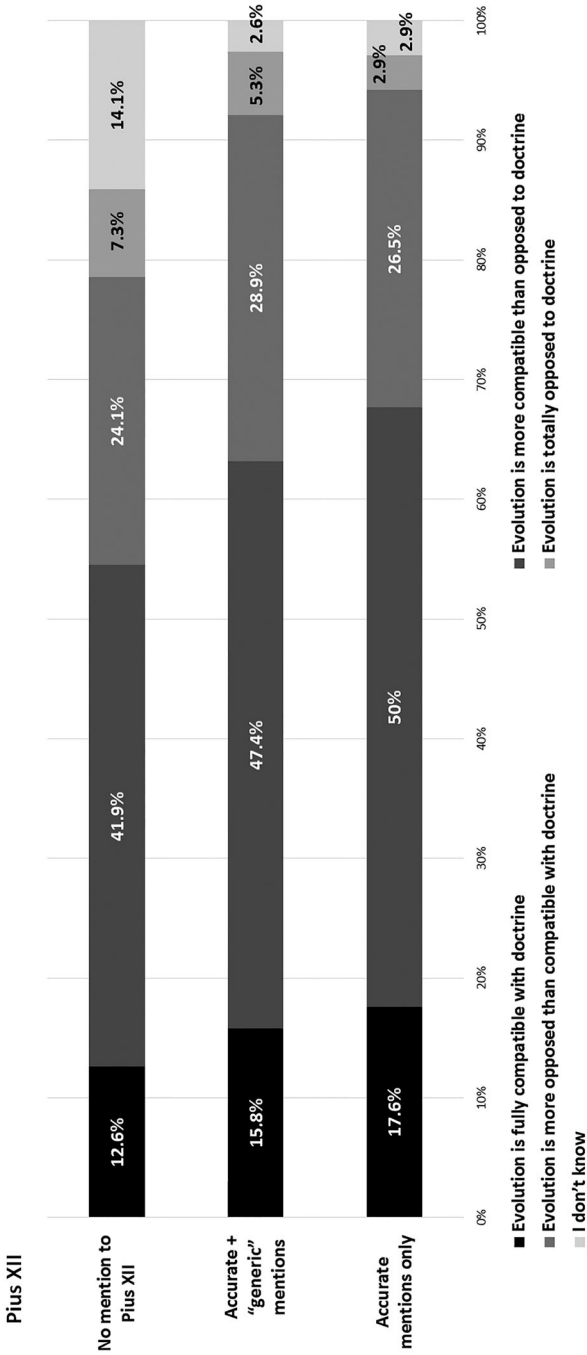
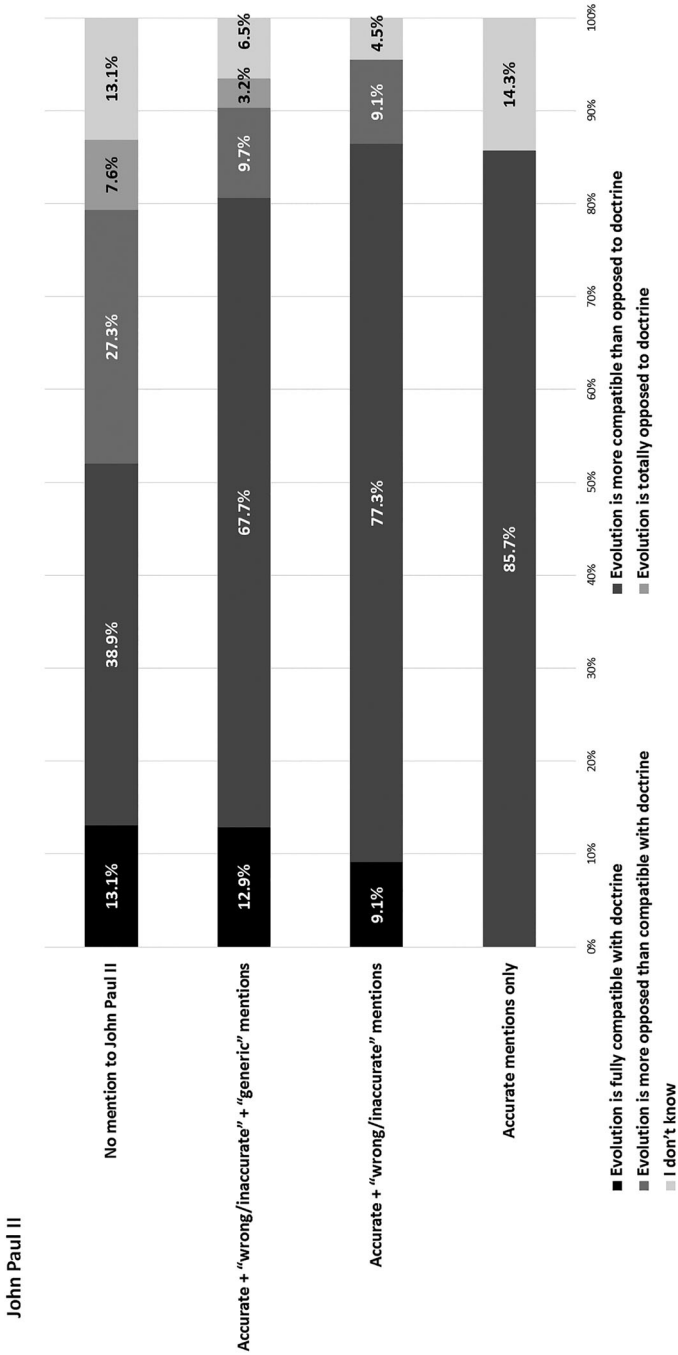
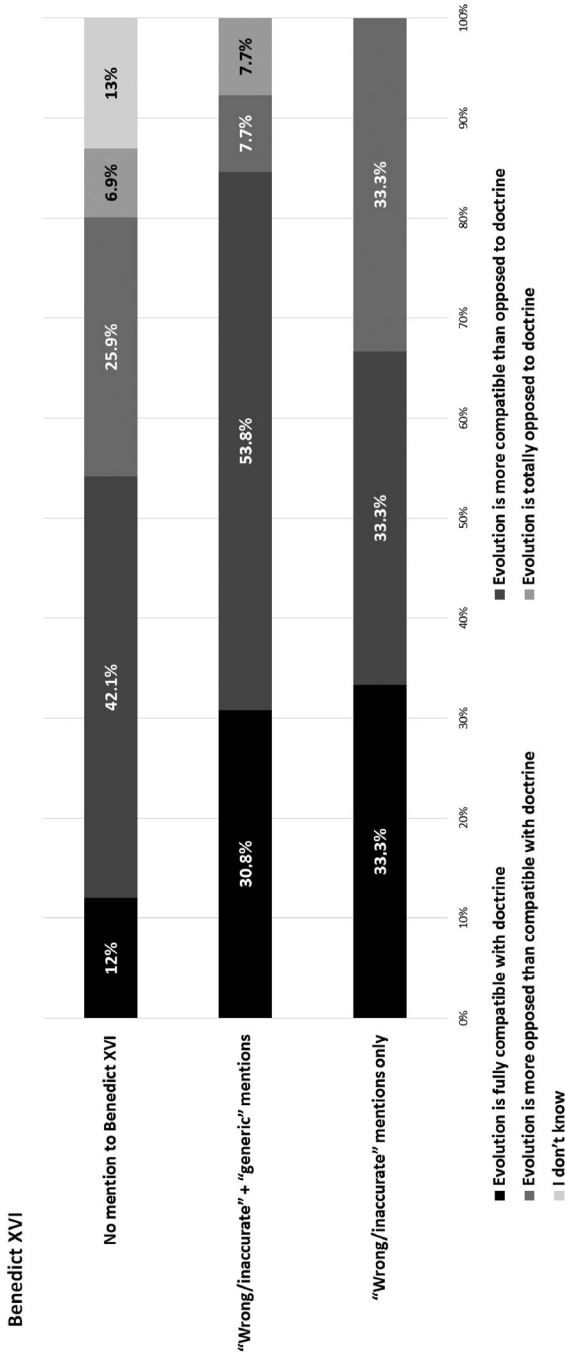


Figure 5. Views on compatibility according to awareness of papal statements on evolution: Pius XII.  
Source: Survey data.



**Figure 6.** Views on compatibility according to awareness of papal statements on evolution: John Paul II.  
 Source: Survey data.

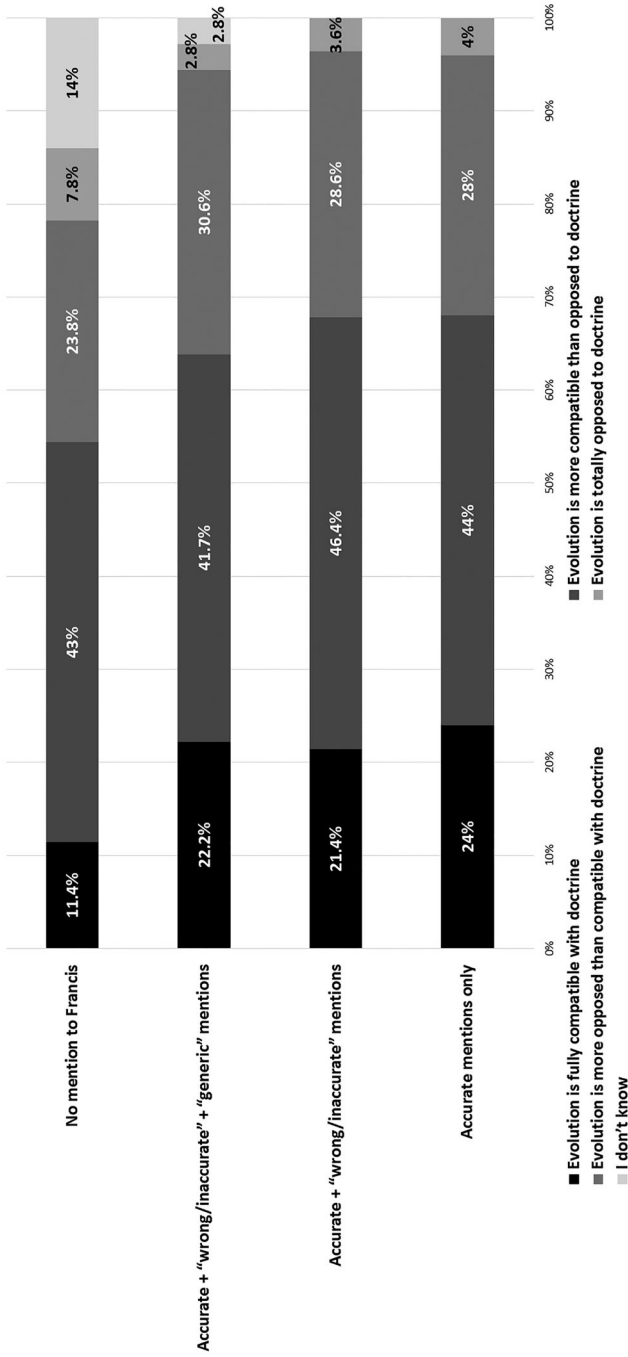


**Figure 7.** Views on compatibility according to awareness of papal statements on evolution: Benedict XVI.

Source: Survey data.



Francis



**Figure 8.** Views on compatibility according to awareness of papal statements on evolution: Francis.  
Source: Survey data.

- “As far as I know, evolution claims that mutations took us to our present stage, but it’s quite problematic to say that we owe human beings’ level of complexity to this process only. Another complicating issue is the fact that, when it comes to humans, we aren’t talking only about an adaptability mutation, but about a huge qualitative leap. We are not talking about the mere acquisition of a mechanic ability or a colour change, but about the difference between a man and a bonobo” (propaedeutic year; has a degree in history; 5/7; thinks evolution is “more opposed than compatible” with Catholicism).
- “Evolution seems incompatible with Natural Law itself, which is confirmed by sound doctrine. It’s a metaphysical incompatibility. ‘The lesser cannot produce the greater’, ‘the effect cannot be greater than the cause’, etc. To be supported, evolution must postulate a Cause of causes who, being in Act, can produce effects greater than intermediate causes” (fourth year of Theology; 6/7; thinks evolution is “more opposed than compatible” with Catholicism; knows *Humani Generis*).

#### DISCUSSION

Seminarians who answered the survey for this research displayed a lower support for evolution (48 percent) compared to the Brazilian population at large, or Brazilian Catholics in particular, surveyed in 2010 and 2014, although the surveys are different from each other. The Datafolha poll used the methodology and wording of polls made by Gallup in the United States (Gallup 2019), and focused on the origin of human beings, presenting a more restricted choice of options to respondents: 8 percent said that “human beings have developed over millions of years from less advanced forms of life, but God had no part in this process”; and 59 percent answered that “human beings have developed over millions of years from less advanced forms of life, but God guided this process”, with 60 percent of Catholics selecting this answer (Datafolha 2010; Schwartzman 2010). The Pew Research Center poll, on the other side, measured evolution support without asking whether respondents believed in a “divine guidance” over the process: 66 percent of all respondents, and 68 percent of Catholics, said that “humans and other living things have evolved over time” (Pew Research Center 2014).

Another significant difference between the seminarians surveyed for this research and the 2010 and 2014 polls was the very low support for creationism (3.5 percent among seminarians, against 24 percent of Catholics in the Datafolha poll, and 27 percent of Catholics in the Pew survey). Besides, one in four seminarians holds an alternate view on origins that was not covered by the options presented to them in the survey. It is also important to stress that, while around half of respondents displayed some degree of evolution acceptance, a much wider majority dismissed claims

made by both atheist and creationist sides regarding Darwinian evolution and religion.

A high degree of overlap was found between the groups of respondents who consider evolution as true, and those who believe it is compatible with Catholic teaching. This overlap, however, needs further clarification to help understand how seminarians develop their personal views. For some, being persuaded by the evidence for evolution may have opened doors for considering it compatible with the Catholic faith, while others may have followed the opposite path, and yet others may have arrived at both conclusions simultaneously.

The survey intended to test whether evolution acceptance (both as true and as compatible with Catholic teaching) was higher among seminarians who were more knowledgeable about evolution, and among those who were aware of papal statements on evolution; both hypotheses were confirmed. Regarding seminarians' knowledge on evolution, the first four sentences of the short "evolution test" dealt with the origin of humans and what natural selection means, and all four of them were correctly answered by the majority of seminarians (see Supporting Information, Table S3); it was the last three questions that drew the line between seminarians with a higher knowledge of evolution from the others, and where the discrepancies between self-declared and actual knowledge stood out. The fifth, sixth, and seventh questions—dealing, respectively, with the descent of all life forms from a single life form, whether Darwinian evolution explains how life appeared on Earth, and the randomness of mutations—were correctly answered by 26 (60.4 percent), 21 (48.8 percent), and only 16 (37.2 percent) of the 43 seminarians who claimed to know evolution "very well". The groups of seminarians who scored higher in the "evolution test" displayed a higher degree of evolutionary views and belief in the compatibility between evolution and Catholic faith.

The novelty brought by the survey is the correlation between knowledge of papal statements on evolution and its acceptance, both as true and as compatible with Catholic teaching. When asked about their views on origins, all but one group of seminarians—the ones who accurately mentioned John Paul II's speech to the Pontifical Academy of Sciences (John Paul II 1996)—espoused evolutionary views (both "God-guided" and "non-guided") above the average of all respondents (48 percent). This exception to the pattern can be puzzling, since John Paul II's statement concerned directly the veracity of the theory, more than its compatibility with Catholic teaching.

The correlation between awareness of papal statements and evolution's compatibility with the Catholic faith is more evident. The "favourability" of evolution—the sum of "more compatible than opposed" and "fully compatible with the doctrine" answers—in every scenario was above the average of all respondents (55.9 percent). For those aware of statements

made by Popes Pius XII and Francis, favorability increased gradually until the last group, of those who provided accurate quotes, that is, seminarians who not only knew that these Popes had spoken about evolution, but also were aware that the pontiffs had made *positive* remarks about it.

The relation of causation between knowledge of papal statements and acceptance of evolution is yet to be established. The questionnaire did not go further in finding out whether a seminarian's awareness of a positive mention to evolution by a Pope influenced the acceptance of evolution as a fact or as compatible with Catholic doctrine, or whether a seminarian already held favorable views toward evolution before discovering what pontiffs had said or written about it—which could confirm or reinforce a previous opinion rather than changing it. Such causation relationship was found by Manwaring et al. (2015) among Mormon undergraduate students: evolution acceptance increased after a group of students had the opportunity to learn and discuss their church's neutral stance on evolution. The authors believe the same impact can be found in other Christian denominations. In this case, evolution advocates may find unexplored ground to work among Catholics, since awareness about papal statements on evolution was low: 134 seminarians, or 58.5 percent of all respondents, were not able to provide any kind of mention of papal statements on evolution, not even those considered “wrong/inaccurate” or “generic”. In this group, 43.4 percent had evolutionary views on origins and 47 percent had favorable views about the compatibility between Catholic doctrine and evolution—both numbers are below the average of all respondents.

Promoting awareness about what Popes have written or said on evolution, however, is not enough, given the share of seminarians who still have unfavorable views on evolution despite their knowledge of such statements. The objections raised by seminarians who do not consider evolution compatible with Catholic teaching may provide a useful guide on which issues must be addressed in order to increase evolution acceptance. The *Catechism of the Catholic Church*, even if it does not mention evolution by name, argues against a creationist view when stating that creation “did not spring forth complete from the hands of the Creator” (Catholic Church 1997, § 302), but at the same time does not offer deeper insight on how to reconcile Darwinian evolution and Catholic doctrine; this challenge has been taken on by Catholic theologians and scientists who have been working on the subject for decades, suggesting several ways to answer the objections raised by Catholics against evolution. One example is the discussion on how God acts through secondary causes and the role of chance, randomness, and providence in evolutionary processes; many authors have written about it, including in nonscholarly books (Miller [1999] 2007; Artigas and Turbón 2007; Trasancos 2016; Austriaco et al. [2016] 2019; Novo 2020). *Communion and Stewardship*, a document issued by the International Theological Commission under the presidency

of then Cardinal Joseph Ratzinger, takes evolution for granted and also offers a view on the issues of causality and providence in creation (International Theological Commission 2004, § 63, 68, and 69).

It does not come as a surprise that most objections to evolution deal with the origin of man and the doctrine of the Fall. The meaning of being human, the “ontological leap” that defines mankind, is the main reason why the Catholic Church cares about evolution (John Paul II 1996). In his 1996 address to the Pontifical Academy of Sciences, Pope John Paul II explained what makes humans unique: “With his intellect and his will, he is capable of forming a relationship of communion, solidarity and self-giving with his peers”. Humans have “the experience of metaphysical knowledge, of self-awareness and self-reflection, of moral conscience, freedom, or again, of aesthetic and religious experience” (John Paul II 1996). Besides, traditional Catholic teaching describes the original sin as “transmitted by propagation, not by imitation”, and as “result of generation” (Denzinger 2007, § 223 and 1513); more recently, the *Catechism of the Catholic Church* claims that the transmission of the original sin is “a mystery that we cannot fully understand” (Catholic Church 1997, § 404). This traditional view requires every human being to have a real Adam and Eve as “first parents”, and this is one of the reasons why Pius XII vetoed the polygenist hypothesis in *Humani Generis* (Pius XII 1950, § 37). Besides, monogenism may be a necessary condition to hold the notion of unity of the human race (Catholic Church 1997, § 404; Trasancos 2016, 135). However, consensus about a much larger size of the first human populations has emerged within modern evolutionary biology; even *Communion and Stewardship* acknowledges that and includes a “whether as individuals or in populations” remark when mentioning the “emergence of the first members of the human species” (International Theological Commission 2004, § 63 and 70).

Any attempt of reaching Catholics to raise acceptance of evolution needs to consider the issue of the “first parents”, the controversy between monogenism and polygenism, and original sin, especially considering that modern genetics has established that it is impossible for the whole mankind to have descended from a single couple (BioLogos Editorial Team 2014; Venema 2015). In one of the latest books on evolution in Portuguese aimed at Catholics, Novo (2020, 111) writes: “The question ‘who exactly was the first human being?’ is irrelevant, once it is impossible to answer it, just like it is impossible to define the moment when a child loses her innocence and grows up” (my translation). If the goal of such a book is merely to explain evolution and to describe the processes that led to the appearance of humans on Earth, it may be irrelevant indeed, but who the first humans were and what they did is of utmost importance for the history of salvation (Benedict XVI 2008a). Dodging the issue may do little to persuade Catholic “sceptics”, as the author calls those who resist

the idea of evolution, even when the evidence for evolution is presented compellingly.

Catholic scholars have been suggesting many different hypotheses in an attempt to address all these subjects. The issue of “hominization”—the process of becoming human—has been discussed among Catholics at least since Teilhard de Chardin’s ([1959] 2008) famous “man came silently into the world”, including Joseph Ratzinger’s (2008, 139) mention to the “first ‘thou’ that – however stammering – was said by human lips to God” as the moment “in which spirit arose to the world”. In addition, authors who write about evolution for a wider Catholic audience do acknowledge the difficulty brought by the doctrine of original sin, even if some of them do not intend to offer answers. Artigas and Turbón leaned toward monogenism, claiming that “there are scientifically respectable possibilities that explain the monogenistic origins of modern man” (Artigas and Turbón 2007, 133). Almost a decade later, Trasancos said that “current scientific evidence points to a first population of humans rather than a single man and woman” (Trasancos 2016, 136) and, after mentioning a series of questions that arise when monogenism is put aside, concluded that “We simply don’t know at this point in history. This is a matter for the trained scientists and trained theologians,” and that “there will not be any declarations [by the Magisterium of the Church] as long as the understanding remains ambiguous”.

Theologians have attempted to reconcile traditional teaching on original sin and the recent scientific consensus about the size of the first human populations, including a change in the understanding of “propagation” and “imitation” (Duffy 1988), and the idea of a “theological/philosophical monogenism” within a “biological polygenism” (Flynn 2011; Feser 2011a, 2011b, 2011c, 2014; Kemp 2011). Kenneth Kemp argues that the “theological doctrine of monogenesis requires only that all human beings have the original couple among their ancestors, not that every ancestral line in each individual’s family tree leads back to a single original couple” (Kemp 2011), which allows for maintaining the traditional understanding of the original sin and its transmission “by propagation,” while accepting the scientific consensus about the size of the first human populations. In Brazil, Benedictine monk Estêvão Bettencourt, famous by his *Pergunte e responderemos* (“ask and we will answer”) leaflets, drifted from a strict monogenist stance (Bettencourt 1959) to the acceptance of the so-called “polyphyletic monogenism” (Bettencourt 2001) as compatible with the Catholic faith, even if he does not make it clear whether he adheres to it himself. It is unclear whether seminarians are aware of at least some of such attempts and, in case they are, whether they believe such attempts are adequate, poor, or even opposed to doctrine. The debate remains open; none of these hypotheses has been officially endorsed by the Catholic Church so far, and the search for answers is still an ongoing effort.

## CONCLUSION

In a 1989 speech to members of doctrinal commissions of European episcopal conferences, Cardinal Joseph Ratzinger lamented the “almost complete disappearance of the doctrine on creation from theology” and said that a “renewed Christianity” could offer an alternative to awake mankind from its “deep desperation (...) which hides behind an official façade of optimism”, but “only if the teaching on creation is developed anew. Such an undertaking, then, ought to be regarded as one of the most pressing tasks of theology today” (Ratzinger 1989). Ratzinger, however, does not claim this new “teaching on creation” must take Darwinian evolution into account; he merely says that the place of such teaching “has been taken by a philosophy of evolution (which I would like to distinguish from the scientific hypothesis of evolution)”, without pointing any specific scientific theory to be integrated into or considered in the new teaching on creation.

Are today’s Brazilian Catholic seminarians up to the challenge laid out by Ratzinger? Around half of the seminarians surveyed for this research think that Darwinian evolution can be reconciled with Catholic faith and incorporated into the creation narrative, which also requires the belief in a world created by God. Such conciliation demands further philosophical and theological developments on issues like the existence (or not) of purpose in nature, or in the evolutionary processes; the origin of humans; and how to reconcile recent scientific findings with Catholic doctrine, especially that of the original sin. This effort has been carried out by scholars through the latest decades and many questions are still left open. For some of the surveyed seminarians, however, such difficulties are an even larger stumbling block, preventing them from accepting evolution as either true or compatible with Catholic teaching. It is noteworthy that a very small share of seminarians adheres to a creationist, fully literal reading of the first chapters of Genesis.

The main finding of this survey is the correlation between acceptance of evolution as true or compatible with Catholic faith and awareness of papal statements on evolution—positive views of evolution were more frequent among seminarians who knew what Popes Pius XII, John Paul II, Benedict XVI, and/or Francis have said or written on the subject. Most seminarians, however, declared not to know any of such statements, a fact that should be taken into account by evolution advocates even if the causation link between awareness of papal statements and evolution acceptance has not been established in the survey.

For a better understanding of how a Catholic seminarian (or layperson) organizes his thoughts on the subject, and considering the limitations of online questionnaires, which are often unable to unfold in the ways required to account for the variety of possible answers on this topic, I suggest in-person, semistructured interviews like those used by Riley (2019) in

order to clarify many of the issues raised by this survey. For seminarians who have positive views of evolution and also know what Popes have said on the subject, has such awareness influenced their acceptance of evolution? Would a seminarian who has negative views on evolution and no knowledge of any papal statement be willing to reconsider his stance after learning about the Popes' acceptance of evolution? Are seminarians who raise theological/philosophical objections to evolution knowledgeable about the most recent attempts to reconcile evolutionary theory and the Catholic views on man and original sin—and, if so, what are the flaws they see in such attempts? If 25 percent of the seminarians surveyed do not adhere to any of the “mainstream” views on the subject (creationism, ID, God-guided evolution, and non-guided evolution), what exactly is their view? Answers to these questions will show whether emphasizing the opinion of the Popes is a useful strategy to advance evolution acceptance among Catholic clergy—even if such acceptance is considered “imperfect”, because driven by authority, and not by the evidence for evolution itself—and will also point to controversial issues that need a more profound consideration by philosophers, theologians, and scientists dealing with the relationship between the Catholic faith and evolution.

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#### SUPPLEMENTARY INFORMATION

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