EFFECTS OF ACADEMIC DEGREE AND DISCIPLINE ON RELIGIOUS AND EVOLUTIONARY VIEWS IN CHILE AND COLOMBIA

by César Marín, Victor Hugo García-Merchán, Julián David Arbeláez-Moreno, Esteban Camilo Ochoa-Berrío, Diego Martínez-Rincón, and Guillermo D'Elía

Abstract. Relationships between degree/area of academic formation and religious and Darwinian views are controversial. This study aimed to compare the religious beliefs and acceptance of Darwinian evolution between two contrasting South American scientific communities (Chile and Colombia), accounting for different degrees and areas of academic formation. In 2018, 115 last year bachelor students (surveyed as freshmen in 2014 for a previous study) from Chile, and 283 first/last year bachelor students, graduate students, and professors from Colombia, all belonging to biology, chemistry, or physics, were surveyed. Chilean students/faculty were significantly more agnostic/atheist, more accepting of Darwinian evolution, and less creationist than their Colombian counterparts. Academic degree and area differently affected these views in both countries, as only in Chile there was a clear tendency among biologists and physicists with higher degrees to hold less religious and creationist views. Marked differences between the history, socioeconomic contexts, and especially in high school and university curricula of both countries might explain these results.

Keywords: academic curricula; biology; creationism; Darwinian evolution; physics; scientific community; secularism; South America

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Background

The relationship between academic formation and religious beliefs and/or acceptance of evolution is contentious (Johnson 1997; Zuckerman 2009; Lee and Bullivant 2010). Meisenberg et al. (2012) found, after controlling for country, sex, and age in a 96 countries survey, a slight but significant negative relationship (–0.053) between years of education and religiosity, understood as believing in God. Likewise, Dutton et al. (2019) found that nonreligious people in average might possess some specialized abilities that may lead them to choose the study of science. These trends seem to support the secularization hypothesis, the idea that as humans are more increasingly able to explain and understand the universe using scientific-based inquires, religious explanations will fade into history (Wallace 1966; Bruce 2002). At the same time, education has been found to be more associated with greater science appreciation, especially in countries with high levels of scientific activity (Noy and O'Brien 2019). In contrast, more religiosity is associated with higher skepticism regarding even well-established scientific ideas or facts as evolution and climate change (Ecklund et al. 2017). Thus, there is strong evidence (Lynn et al. 2009; Lee and Bullivant 2010; Dutton and van der Linden 2017; Ellis et al. 2017) to suggest that the degree of academic formation is inversely related to the level of religiousness.

The inverse relationship between specialized abilities (leading to study science) and religiousness (Dutton et al. 2019) could explain that, particularly in the northern hemisphere, for more than a century, university scientists have been found to be less religious than the general public (Leuba 1916; Leuba and Kantor 1917; Larson 1997; Gross and Simmons 2009). Similar findings and trends have been found regarding the acceptance of Darwinian evolution (Dagher and BouJaoude 2005; Jensen et al. 2007; Kampourakis and Zogza 2007; Gregory and Ellis 2009; Pazza et al. 2010; Kim and Nehm 2011; Dias et al. 2012; Penteado et al. 2012). Despite all the research conducted on this topic, not much is known about how religiousness and acceptance of evolution vary among people with different levels of academic formation, nor is it well documented how being involved on different scientific areas might relate with religious beliefs and the acceptance of Darwinian evolution. Most of these studies have been conducted on western, industrialized, rich, and democratic (WEIRD; Henrich et al. 2010) countries of the northern hemisphere, that represent only a fraction of the World population. For instance, not much is known about the beliefs of the scientific community of South American countries, which are less industrialized and rich. As such, cross-cultural studies on these countries are essential to overcome current limitations of human behavior/beliefs studies (Tung 2008).

Marín and D'Elía (2016) presented a survey of 544 members of a southern liberal Chilean university, investigating whether their religious beliefs and acceptance of evolution were affected by the degree (first and last year bachelor degree students, graduate students, and faculty) and area (biology, chemistry, and physics) of academic formation. They found that nonreligiosity, as well as the acceptance of Darwinian evolution, increased with the possession of an advanced degree; this correlation was stronger for individuals who studied biology and physics than to those who studied chemistry (Marín and D'Elía 2016). The generality of the results presented by Marín and D'Elía (2016) can be strengthen by conducting two additional research steps: (1) resurveying with the same questions the then first year bachelor students at a time close to obtaining their degree—this exercise would allow to test if their beliefs changed over time; and (2) applying the same questions in another university with, among others, differences in socioeconomic, historical, and/or national backgrounds, as a way of testing the effect of these differences.

This study is aimed to: (1) Follow the trends of religious beliefs and acceptance of Darwinian evolution of previously surveyed first year Chilean bachelor degree students (Marín and D'Elía 2016), whom on the present study were last year bachelor students; and (2) Conduct a cross-cultural comparison of religious beliefs/acceptance of Darwinian evolution on the academic communities composed of people with different degrees and areas of academic formation, in two schools of basic sciences of two contrasting South American countries, Chile and Colombia. The socioeconomic conditions of these countries are somewhat contrasting, as Chile in 2017 had a Human Development Index (HDI) of 0.843 (very high human development) with 10.3 average years of schooling, while Colombia in 2017 had an HDI of 0.747 (high human development) with 8.3 average years of schooling.

Methods

A personal, anonymous, and printed questionnaire was given to 115 (out of 194) undergrads that in 2014 were freshmen in the study of Marín and D'Elía (2016), and that at the moment of the present survey (2018) were last year bachelor students of the Facultad de Ciencias (School of Sciences), of the Universidad Austral de Chile (Austral University of Chile; UACh), in Valdivia, Chile (Cl) during February and March of 2018. The same questionnaire was given to 283 individuals of the Facultad de Ciencias Básicas y Tecnológicas (School of Basic and Technological Sciences), of the Universidad de Quindío (Quindío University-UniQuindío), in Armenia, Colombia (Col) during February and March of 2018. The surveyed individuals represented the following academic backgrounds (degree): first year undergraduate students (for Col), fifth (last) year undergraduate

students (for Cl and Col), graduate students from MS programs (for Col), and faculty (for Col) (Table 1). Information on degree program (for students) or department affiliation (for faculty), sex, and age was asked in the survey (Table 1). Academic experience was categorized into four classes: first year bachelor degree students (BS First), fifth year bachelor degree students (BS Last), graduate students (Gr.), and faculty (Prof.). Each participant was classified as belonging to one of the three following study areas: biology, chemistry, or physics (Table 1).

Nine questions (Q) were asked on the questionnaire. The first question (Q-I) was related to religious beliefs; the second question (Q-II) was related to the relationship between science and religion; the third question (Q-III) concerned to opinion on the Bible; the fourth question (Q-IV) targeted opinion on human evolution; and the last five questions (Q-V to Q-IX) asked about the degree of agreement with statements regarding the intervention of God or some higher power in the origin of the Universe, the survival of consciousness after death, the existence of miracles, intelligent design, and the relationship between science and religion.

Statistical Analysis

As our data included multiple categorical dependent and independent variables, multinomial logistic regressions (Venables and Ripley 2002) were performed; this classification method generalizes logistic regressions to multiclass problems with more than two possible discrete outcomes and categorical independent variables. This type of analysis is widely used and recommended in the social sciences (Petrucci 2009). Multinomial logistic regressions were performed to test the effects of degree, area, age, and sex (Model 1; ~Degree+Area+Age+Sex) on the answers to all questions for UniQuindío (Col). A second model added the data from Marín and D'Elía (2016) to the data collected here, and included country as a predictor (Model 2; ~Degree+Area+Age+Sex+Country) on the answers to all questions. For this second model, last year bachelor students from both cohorts (2014 and 2018) were treated as one group, as there were no significant differences among them. As Q-II was not asked in the Marín and D'Elía (2016) study, the model for this question was calculated with a lower *n*. As each predictor had too many categories, interactions were not examined. The multinomial logistic regressions were performed with the function "*multinom*" of the *nnet* package (Venables and Ripley 2002) in Rstudio (R Studio Team 2020).

The overall multinomial logistic regression results in AIC parsimony values, regression coefficients, and SE, from which *z*-values are calculated by dividing the regression coefficients by their SE. If the *z*-value is too large in magnitude—either positive or negative, it indicates that the corresponding regression coefficient is not 0, and thus, that the predictor variable has

Table 1. Academic Programs at the School of Sciences, UACh, Chile (in 2014 and 2018) and the School of Basic and Technological Sciences of UniQuindío, Colombia Segregated by Degree and Area

Country	Degree	Area	Number	% Women	Average age	Composition
Chile	BS First year (2014)	Biology	107	53.27	18.92	Five programs
		Chemistry	34	35.29	17.76	Two programs
		Physics	53	35.85	18.15	Two programs
		All	194	45.13	18.50	Nine programs
	BS Last year (2018)	Biology	77	50.64	22.12	Five programs
		Chemistry	25	36.00	21.72	Two programs
		Physics	13	53.85	22.23	Two programs
		All	115	47.83	22.04	Nine programs
Colombia	BS First year	Biology	78	48.72	19.20	Two programs
		Chemistry	16	68.75	18.87	One program
		Physics	35	25.71	19.11	Three programs
		All	129	44.96	19.14	Six programs
	BS Last year	Biology	25	64.00	21.56	Two programs
		Chemistry	15	53.33	22.93	One program
		Physics	32	21.87	23.94	Three programs
		All	72	43.06	22.90	Six programs
	Graduates	Biology	12	66.67	25.83	Two programs
		Physics	5	20.00	29.00	One program
		All	17	52.94	26.76	Three programs
	Professors	Biology	33	37.14	41.12	Two programs
		Chemistry	10	40.00	39.10	One program
		Physics	22	36.36	50.04	Two programs
		All	65	37.31	43.83	Five programs

Note: Details pertaining to average age (in years), sex composition, and number of surveyed people are given for each group.

a significant effect on the response variable, which is verified by p-values <0.05.

Results

The development of religious beliefs through the undergrad studies (first and last year students) presented contrasting patterns between Chile and Colombia (Figure 1). In Chile, the total percentage of atheists/agnostics went from 27.37% among first year bachelor degree students to 64.35% among last year bachelor students, while believers went from 62.37% to 35.65% (Figure 1); this pattern is consistent in the three surveyed areas (biology, chemistry, and physics). In contrast, Colombian first year bachelor degree students held atheistic/agnostic views at a 23.26%, percentage reduced to 9.72% on the last year of bachelor studies (Figure 1)—but, Colombian students belonged to two different cohorts. Colombian biologists with deistic views went from 17.95% on the first year of bachelor studies, to 40% on the last year (Figure 1). Colombian graduate students and faculty showed relatively low percentages of atheistic/agnostic views (about 30%; Figure 1), when compared to Chilean researchers on the same levels ($>60\%$ and $>70\%$, respectively; Marín and D'Elía 2016).

Regarding the relationship between science and religion, most respondents in both countries tended to think that science and religion deal with different issues but can coexist, although this percentage was higher on Chilean last year bachelor students (Figure 2). About 20–25% of Colombian first and last year bachelor students, graduate students, and faculty answered that religion and science deal with similar issues and can coexist (Figure 2).

The percentage of Chilean bachelor students whom believed that the Bible represents real history went from about 30% on the first year of studies to $<5\%$ on the last year (Figure 3). This trend did not occur on Colombian bachelor and graduate students, and faculty, as the percentages of people believing that the Bible represents real history were similar through the academic career, being as high as $>20\%$ in respondents from chemistry and physics (Figure 3). High percentages of people in both countries saw the Bible as inspired by God but did not take in a literal way all of its content (Figure 3).

Creationism practically disappeared between first and last year of biology bachelor students in both countries, but interestingly some Colombian graduate students and faculty presented this view (Figure 4). While creationist views on Chilean physics bachelor students decreased from first to last year, these views increased on Colombian physics students over the same period (Figure 4). Overall, in both countries, creationism tended to be less prominent in biology than in the other two areas (Figure 4). Chilean first and last year bachelor students usually had higher

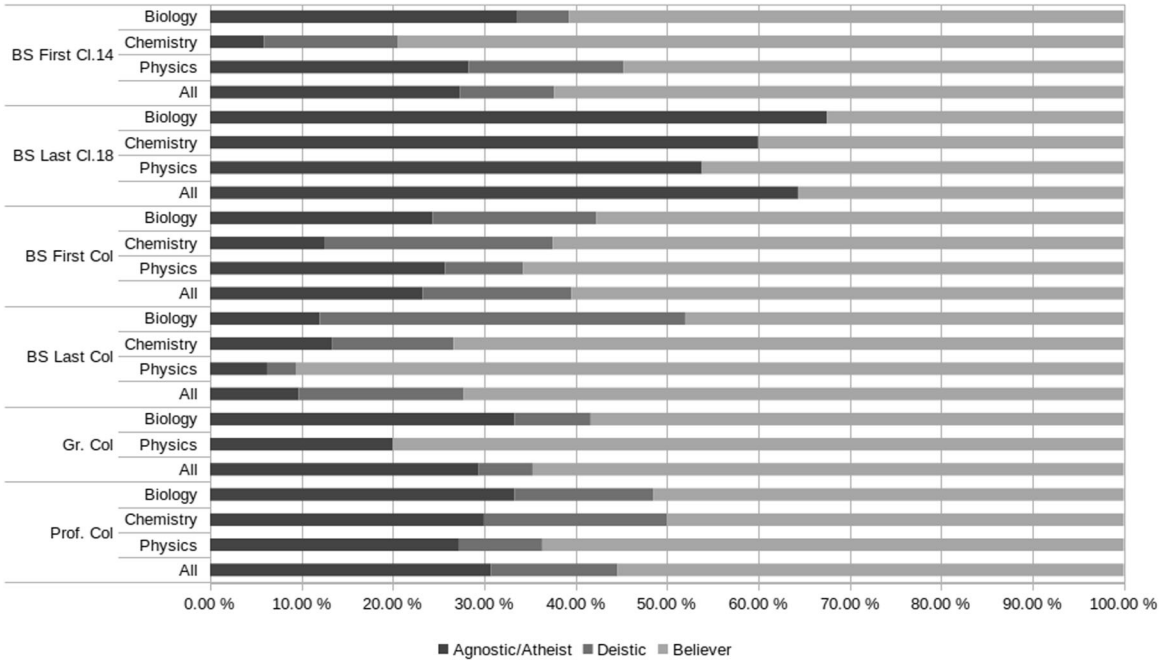

Figure 1. Belief in God by Members of the School of Science of UACh, Chile (Cl), in 2014 (.14) and 2018 (.18), and of the School of Basic and Technological Sciences of UniQuindío, Colombia (Col). The data are sorted by degree level and area of study (Q-I). The question was: "Which of the following statements comes closest to identifying your personal view of God?" The options were: "I do not believe in God"; "I do not know if God exists, but I am inclined to believe that he does not"; "I think it is not possible to know if God exists or not"; "I do not believe in God, but I believe in some supernatural force of some kind"; "Although I have my doubts, I feel that I believe in God"; and "I know that God exists, and I have no doubts about it."

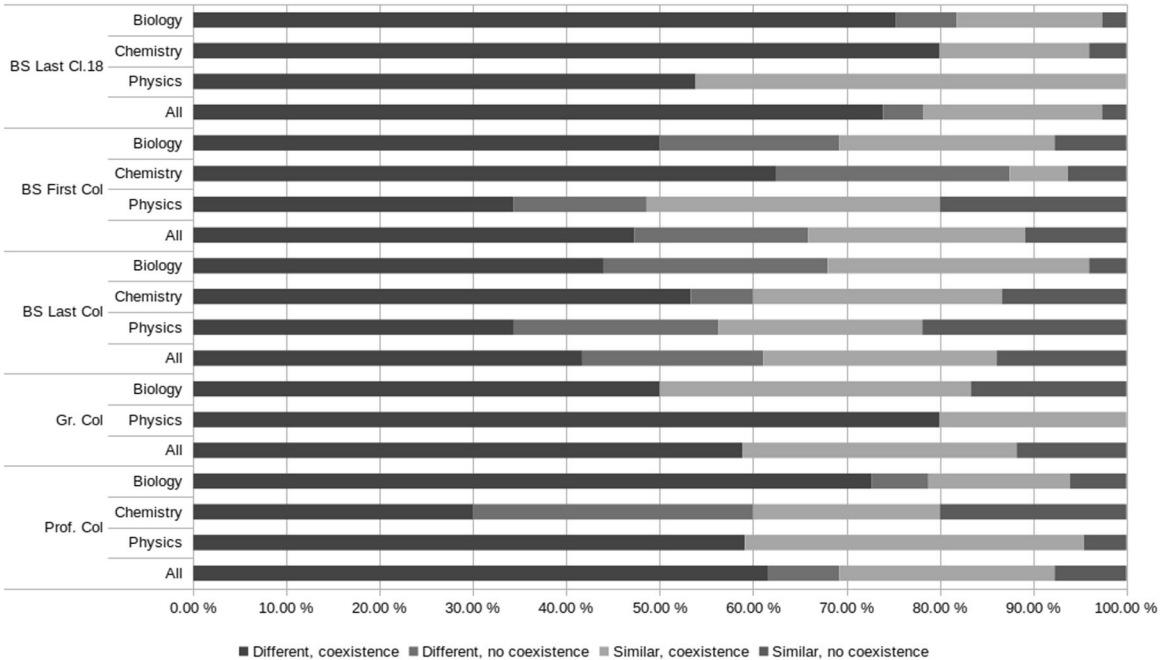

Figure 2. Opinion on the Relationship on Science and Religion by the Members of the School of Science of UACh, Chile (Cl), in 2014 (.14) and 2018 (.18), and of the School of Basic and Technological Sciences of UniQuindío, Colombia (Col). The question was: "Which of the following statements comes closest to reflecting your opinion about the relationship between science and religion?" The options were: "I think science and religion deal with different aspects and can peacefully co-exist"; "I think science and religion deal with different aspects, but they cannot peacefully co-exist"; "I think science and religion deal with similar aspects and can co-exist peacefully"; and "I think science and religion deal with similar aspects but cannot peacefully coexist."

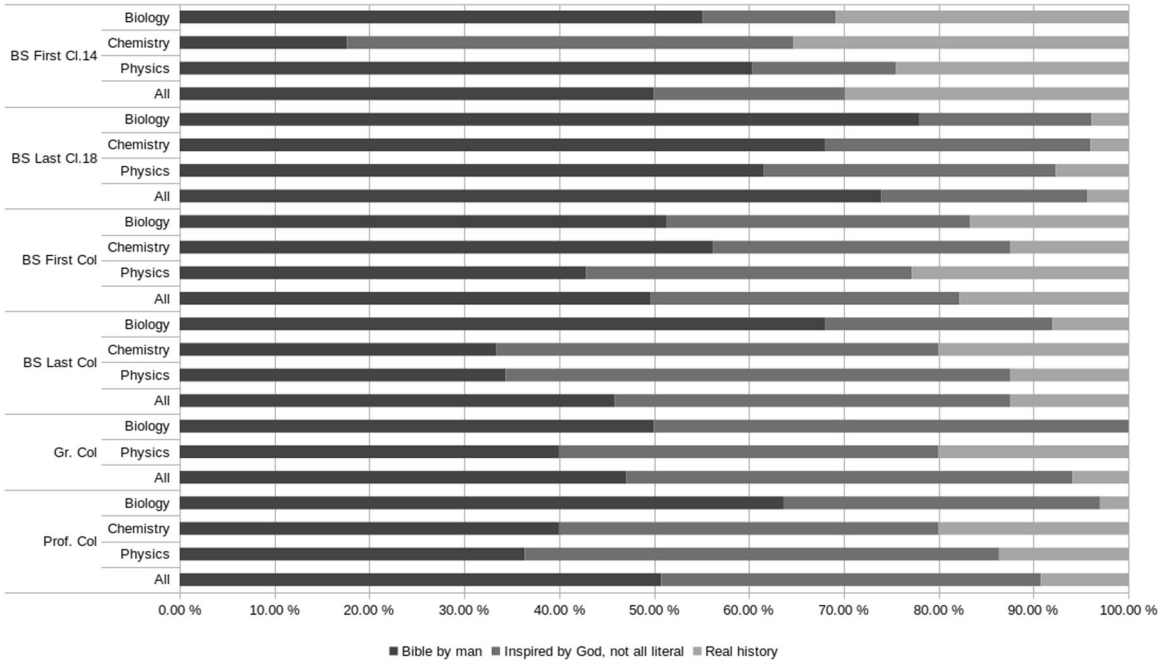

Figure 3. Opinions on the Bible by the Members of the School of Science of UACh, Chile (Cl), in 2014 (.14) and 2018 (.18), and of the School of Basic and Technological Sciences of UniQuindío, Colombia (Col). The data are sorted by degree level and area of study (Q-III). The question was: "Which of the following statements comes closest to reflecting your opinion about the Bible?" The options were: "The Bible is a man-made book of moral precepts"; "The Bible is a moral guide and is the inspired word of God, but not all of it should be taken literally"; and "The Bible is a sacred book adjusted to the real history of humanity."

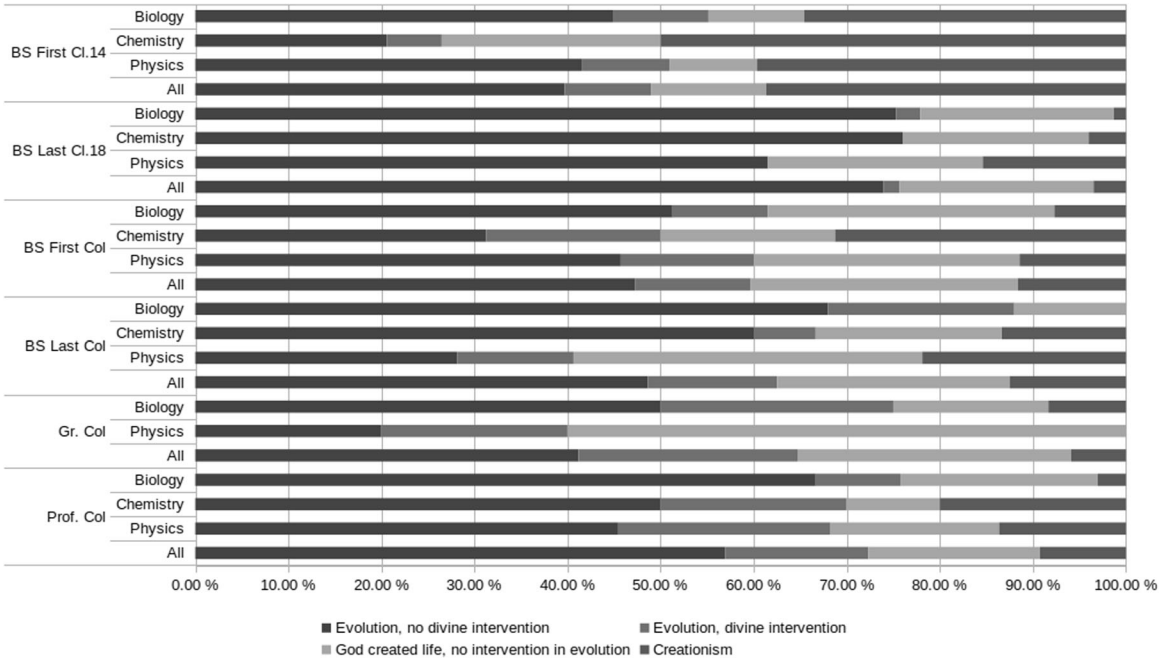

Figure 4. Opinions on Human Evolution by the Members of the School of Science of UACh, Chile (Cl), in 2014 (.14) and 2018 (.18), and of the School of Basic and Technological Sciences of UniQuindío, Colombia (Col). The data are sorted by degree level and area of study (Q-IV). The question was: "Which of the following statements is closest to reflecting your opinion about the origin and historical development of the human being?" The options were: "Humans have evolved from ancestral primates, without divine intervention"; "Humans have evolved from ancestral primates, with divine intervention"; "God originally created life, but has not intervened in the evolutionary process that led to the origin of human beings from ancestral primates"; and "God created human beings in a way similar to how we see ourselves today as explained in the Bible."

disagreement with statements regarding the intervention of God in the origin of the Universe (Figure 5a), in the existence of miracles (Figure 5b), and in creationism as being a comparable view to Darwinian evolution, when compared to Colombian bachelor and graduate students and faculty (Figure 5d).

Academic experience and area of study had significant effects on the answers for all nine questions in the two multinomial regression models, although some of these answers were also explained by age and sex (Table 2), albeit generally with lower effects (Table 3). Age and sex (males) had effects in three and six questions, respectively (Table 3). When the data of the study of Marín and D'Elía (2016) were included in order to test the effect of country (model 2), this factor (particularly Colombia) significantly predicted the answers (Table 3).

Discussion

To our knowledge, this study constitutes the first cross-cultural comparison of religious and evolutionary opinions in the South American scientific community. We found a contrasting pattern between Chilean and Colombian students/faculty. Chileans become less religious as they moved forward in their academic career, a result advanced in the study of Marín and D'Elía (2016) and corroborated here via surveying the same group of bachelor students at the beginning and end of their studies. Meanwhile, Colombians students and faculty presented higher levels of religiosity, which overall did not decrease over the academic career (Figure 1). It is important to note that as we built in our previous study (Marin and D'Elía 2016), we were able to survey the same Chilean bachelor students when they were freshmen (2014) and at the end of their undergrad studies (2018). This strategy allowed to test and corroborate the main suggestion of Marín and D'Elía (2016), namely that the degree and area of academic formation affect religious and Darwinian evolution views. Meanwhile, for Colombia, this was not possible, as we surveyed distinct cohorts of undergrad students (i.e., those at their first or last year of their programs in 2018). Therefore, as such, we cannot rule out that, even when it seems very unlikely, Colombian freshmen and last year bachelor students represent two initially contrasting groups of the Colombian population regarding their religious and evolutionary views. Thus, a follow-up resurveying as we did with Chilean 2014 freshmen would allow to make sounder conclusions about the effect of academic formation in Colombian bachelor students regarding their religious and evolutionary views.

We also found that Colombians, compared to Chileans, favored a literal interpretation of the Bible (Figure 3), creationism (Figures 4 and 5d), and different issues varying from the role of God in the Universe (Figure 5a) to the existence of miracles (Figure 5b). Furthermore, when the data of

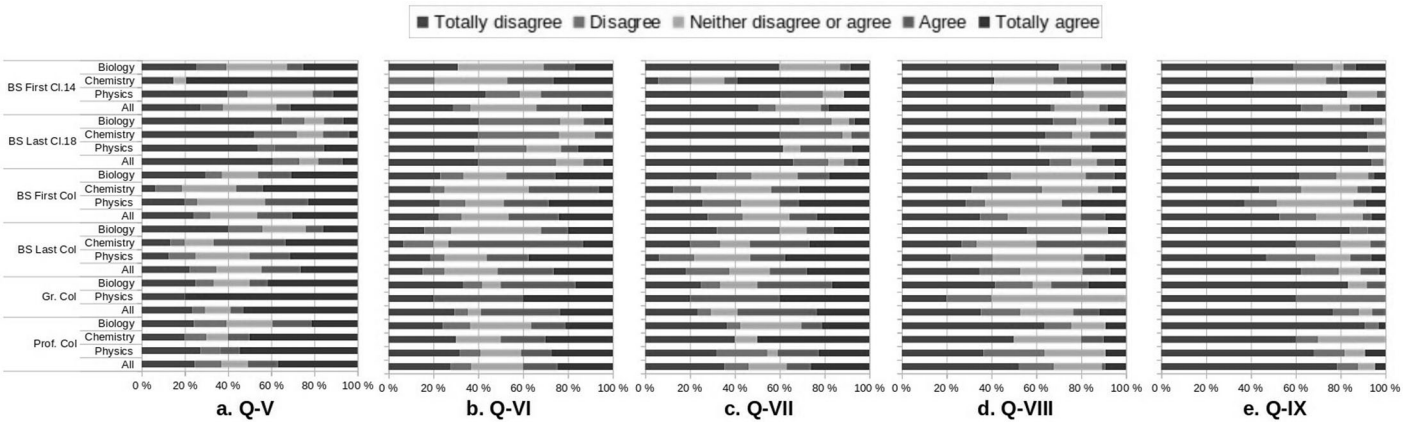

Figure 5. Opinions of the Members of the School of Science of UACh, Chile (Cl), in 2014 (.14) and 2018 (.18), and of the School of Basic and Technological Sciences of UniQuindío, Colombia (Col) on Different Statements (Questions V–IX). The data are sorted by degree level and area of study. The statements are as follows: (a) Q-V: "I believe that God, or some higher power intervened in the origin of the Universe," (b) Q-VI: "I believe that when we physically die, our consciousness, or some part of it, survives," (c) Q-VII: "I believe in the existence of miracles," (d) Q-VIII: "God designed life as we know it, and this is a valid alternative to the Darwinian theory of evolution, and therefore should be taught as such," and (e) Q-IX: "If a scientific explanation contradicts a religious belief, science is wrong."

Table 2. Variables Selected with Multinomial Logistic Regressions: A First Model for UniQuindío (Col) (Mod.1; ~Degree+Area+Age+Sex) and A Second Model (Mod.2; ~Degree+Area+Age+Sex+Country) that Includes the Data from Marín and D'Elía (2016) and Includes Country as a Predictor

Question	Model	Variables	*n*; AIC
Q-I – Belief	Mod.1	Degree, Area, Age	283; 885.947
	Mod.2	Degree, Area, Sex, Country	942; 3090.072
Q-II – Science versus religion	Mod.1	Degree, Area	283; 714.065
	Mod.2	Degree, Area, Country	398; 894.475
Q-III – Bible	Mod.1	Area, Sex	283; 539.263
	Mod.2	Degree, Area, Sex, Country	942; 1611.906
Q-IV – Human evolution	Mod.1	Area	283; 703.274
	Mod.2	Degree, Area, Sex, Country	942; 1894.248
Q-V – Universe origin	Mod.1	Area, Age, Sex	283; 899.356
	Mod.2	Degree, Area, Age, Sex, Country	942; 2646.103
Q-VI – Consciousness	Mod.1	Age	283; 917.231
	Mod.2	Degree, Area, Age, Country	942; 2875.428
Q-VII – Miracles	Mod.1	Area, Sex	283; 923.076
	Mod.2	Degree, Area, Sex, Country	942; 2500.913
Q-VIII – Intelligent design	Mod.1	Area	283; 842.360
	Mod.2	Degree, Area, Country	942; 2032.116
Q-IX – Science versus religion	Mod.1	Degree, Area, Age	283; 632.002
	Mod.2	Degree, Area, Sex, Country	942; 1605.853

Note: *z* and *p* values of the models are included in Table 3. Variables are ordered by their predictive value (highest to lowest) of the answers.

the study of Marín and D'Elía (2016) were added to the data gathered in this study, allowing to include country of provenance in the multinomial regression models, this factor (specifically Colombia) was a very strong predictor for the answers of all nine questions (Tables 2 and 3). In addition, people of both countries agree in thinking that science and religion deal with different issues but can coexist (Figure 2), as suggested by Gould

Table 3. The *z* and *p* Values of Multinomial Logistic Regressions: A First Model for UniQuindío (Col) (Mod.1; ~Degree+Area+Age+Sex) and A Second Model (Mod.2; ~Degree+Area+Age+Sex+Country) that Includes the Data from Marín and D'Elía (2016) and Includes Country as a Predictor

		Degree				Area				Sex		Country	
Quest.	Mod.	BS F	BS Last	Gr.	Prof.	Bio	Chem	Phys	Age	M	F	Cl	Col
Q-I	Mod.1			$-3.96\times10^{6*}$			$-1.32\times10^{7*}$		-2.112^{*}				
	Mod.2		-4.645^{*}	-4.334^{*}	-3.412^{*}		5.590^{*}			-2.843^{*}			6.810^{*}
Q-II	Mod.1			$-1.31\times10^{7*}$				2.172^{*}					
	Mod.2			$-9.74\times10^{6*}$				2.191^{*}					3.637^{*}
Q-III	Mod.1							2.919^{*}		-2.308^{*}			
	Mod.2		-5.546^{*}	-3.849^{*}	-2.853^{*}		5.786^{*}	2.116^{*}		-2.666^{*}			4.983^{*}
Q-IV	Mod.1						2.893^{*}	3.280^{*}					
	Mod.2		-6.181^{*}	-3.438^{*}	-2.848^{*}		5.842^{*}	3.569^{*}		-2.934^{*}			4.342^{*}
Q-V	Mod.1						2.633^{*}		-2.081^{*}	2.171^{*}			
	Mod.2		-4.582^{*}				6.942^{*}	2.001^{*}	-2.361^{*}	-1.987^{*}			5.679^{*}
Q-VI	Mod.1								-2.150^{*}				
	Mod.2		2.552^{*}	2.952^{*}			5.684^{*}		-2.275^{*}				5.622^{*}
Q-VII	Mod.1							2.867^{*}		-2.015^{*}			
	Mod.2		2.891^{*}	3.054^{*}			8.349^{*}	4.327^{*}		-2.373^{*}			7.246^{*}
Q-VIII	Mod.1						2.336^{*}	3.138^{*}					
	Mod.2		2.172^{*}	-2.321^{*}			3.793^{*}						7.418^{*}
Q-IX	Mod.1		-2.351^{*}	$-1.23\times10^{7*}$	$-1.42\times10^{5*}$		2.835^{*}	4.386^{*}		-2.743^{*}			
	Mod.2		-3.446^{*}		$-1.81\times10^{5*}$		7.163^{*}	4.176^{*}		-2.851^{*}			3.481^{*}

Note: Only significant *z* and *p* values are shown.Higher z-values, either positive or negative, indicate a higher weight predicting the questions' answers.
$^{*}p$ significance: <0.05; $^{**}<0.01$; $^{***}<0.001$.

(2002). For three questions, related to believing in God, on the origin of the Universe, and on the survival of consciousness after death ("soul"), age had some effect (Table 3). As age and degree are of course highly related variables, it is possible that the effects of degree are masked by age. Sex, specifically males, had significant effects, albeit way lower than area and degree, on the responses for six questions (Table 3). This needs further exploration, because it would imply an unexpected and worth of exploration scenario: the effects of advanced scientific formation on religious and scientific views would differ between males and females, being the latter not especially affected by such formation.

Religiosity has overall decreased over the last century in Europe (Berger et al. 2008; but see Reitsma et al. 2012), remained stable in the United States (Hirschman 2004) and Asian and Middle Eastern countries (Pew Research Center 2015), and even increased in ex-Soviet countries (Froese and Pfaff 2005). Scientific knowledge has clearly increased in all those regions during the last century. Thus, other societal and country-specific factors (Noy and O'Brien 2019), besides the generation of scientific knowledge, affect people's religious beliefs, as it is reflected in our study, at least for Colombia. These results have prompt some contextualized, sociological modifications of the secularization hypothesis, which takes into account specific historical developments, the cultural context, political surroundings, and identity processes (Pickel 2011).

The differences between Chilean and Colombian students/faculty found on this study probably have their base on the differences of religiosity of both countries as Colombia is a significantly more religious country than Chile. According to the Wave 6 of the World Values Survey 2010–2014 (Inglehart et al. 2014; http://www.worldvaluessurvey.org), 23.8% of Chileans and 58.9% of Colombians rate religion as very important in their life, at the time that 61.4% of Chileans and 32.3% of Colombians do not belong to any Church or religious organization. On the same survey, 34.9% and 57.3% of Chileans and Colombians, respectively, strongly agree or agree that "whenever science and religion conflict, religion is always right" (Inglehart et al. 2014). Meanwhile, 35% of Colombians and 26% of Chileans held a creationist view of human development, according to a Pew Research report on religion in Latin America (Bell and Sahgal 2014). Thus, if Chilean and Colombian surveyed students/faculty are equivalent samples of the society of their countries, it is expected that Colombian students and faculty be more religious than their Chilean counterparts.

The historical reasons that may explain the differences on religiosity in both countries need further exploration, which goes beyond the scope of our study; as such, what follows is a contrast of some factors of interest that may help to understand the observed differences. Since the 1833 Constitution, Chile started to incorporate secular elements that resulted in a

definitive State-Church separation in the 1925 Constitution. Meanwhile, the 1886–1991 Colombian Constitution considered Catholicism as the official religion of the country, with a clear orientation towards most conservative Catholic tendencies (Camacho Molano 2008). The 1991 Colombian Constitution finally established the separation between State and Church. The State of Chile has a longer tradition of secularism, with important reforms in the first half of the 1960s (Fernández 2016), than the Colombian State, which started similar reforms much recently (XXI century). Finally, the economic growth of Chile over the last three decades has been significantly higher than that of Colombia; this fact is relevant because lower income, GDP, and welfare have been found to be more associated with religiosity (Storm 2017), which may partially explain the differences between both countries.

There are few if any studies comparing views of religion and Darwinian evolution among biologists, chemists, and physicists (e.g., Stirrat and Cornwell 2013 compared biologists and physicists). For Chile, our data show that chemists are usually more religious and less acceptors of Darwinian evolution than physicists and biologists. It is possible that the evolutionary and cosmological focuses of biology and physics programs, respectively, explain these differences (Marín and D'Elía 2016; Cofré et al. 2018). Interestingly, a large fraction of Chilean chemists and Colombian students/faculty from the three areas believed that God created life but did not intervene in evolution (Figure 4). The high school and university curricula of both countries need to be deeply explored to assess if that is the source causing such contrasting results. Such curricula examination may also help explaining the marked differences regarding the effect of academic degree for both countries, as in Chile heavily affected religious/Darwinian beliefs while in Colombia, apparently, did not. It may be possible that in Colombia, these curricula have lasting effects on the religious/Darwinian views of students, even after getting higher degrees. For Chile, it has been suggested that people belonging to some religious denominations might avoid some academic disciplines based on conflicts with their faith (Marín and D'Elía 2016; see also Greeley 1963). There seems to be a bias toward being less religious for Chilean people who decide to study biology and physics; such bias has been reported elsewhere (Penteado et al. 2012).

Worldwide cross-cultural studies have shown similar results to ours: graduate students usually are less religious than bachelor degree students, which in turn usually are less religious than high school students (Lynn et al. 2009; Mocan and Pogorelova 2017). Although this general trend is well supported by several studies (Dutton and van der Linden 2017; Ellis et al. 2017), there are, however, important exceptions (Dutton et al. 2019); as uncovered in our study, Colombia is one of these. This reiterates the necessity of controlling for local confounding factors through

cross-cultural studies (Tung 2008). It is also important to follow surveyed cohorts, as it was previously recommended (Marín and D'Elía 2016), and at least for Chile, we did find the same results of that previous study (with two different cohorts; first and last year bachelor students), when the answers from a single cohort were followed four years later—at the end of bachelor studies.

It is important to ask, why, in Colombia, an advanced scientific formation seems to not affect religious and evolutionary views? Is this caused by a strong effect of the more-religious context of the Colombian society even on scientists with higher degrees? Is there a stronger societal pressure towardsreligion in Colombian academics compared to Chileans? Is Colombian scientific formation (starting at high school level) less rigorous regarding the teaching of Darwinian evolution? All these questions need a deeper analysis, but there are good indications that besides social differences between both countries, differences on how Darwinian evolution is taught may also explain the observed pattern.

Our results regarding the Chilean university community are relevant regarding the effect of university education. This is because the principles and concepts that explain Darwinian evolution are poorly incorporated in the preuniversity Chilean education system (Medel 2008; Camus 2009; Veloso and Spotorno 2012; Tamayo Hurtado and González García 2016). Although Darwinian evolution is officially included in the Chilean middle school curriculum (Camus 2009), its mention is somewhat superficial (Canto et al. 2012) and in practice, it is almost never taught (Canto et al. 2012; Veloso and Spotorno 2012). In Chile, "magical thinking" is quite prevalent (around 25%) on mid and high school teachers and students (Canto Hernández and Romo López 2018). As such, our results and previous studies (Cofré et al. 2013) suggest a large effect of Chilean university education on the acceptance of evolution and religiosity. At the same time, the incorporation of Darwinian evolution teaching in Colombia seems to be even lower than in Chile, although both countries have severe deficiencies in the teaching of science at this level (Cofré et al. 2015).

Current high school curricula in Colombia are still heavily influenced by the official Catholic education of the country, which lasted until the 1990s (Peñaloza 2016). Upon appearing, Darwinian evolution caused great controversy in Colombian academic community and society (Restrepo Forero 2009), being received with low credibility (Díaz Piedrahita 2012). Darwinism was moderately incorporated in Colombian curricula but only if the Aristotelian view for humans (i.e., humans are in the top of an "*scala naturae*") was taught, and if the Christian God was accepted as the primary cause of evolution (Restrepo Forero 2009; Peñaloza-Jiménez and Mosquera 2014; Peñaloza 2016). Thus, one of the most distinctive Darwinian precepts, the nonteleological value of evolution, was not incorporated into Colombian education. As such, most likely, a large fraction

of the Colombian respondents of our study encounter these Aristotelian, God-as-cause views of Darwinian evolution during their high school education; a view that somehow university education has failed to fully overcome. Indeed, in our study, relatively high proportions of Colombian bachelor and graduate students, and faculty, do believe that God created life without intervening in evolution (Figure 4).

Although currently Chile and Colombia have little to no creationist movements such as those seen in other countries of the region (e.g., Brazil: Cornish-Bowden and Cardenas 2007; Pazza et al. 2010; Penteado et al. 2012), different social aspects of these countries may prompt these movements to operate (Medel 2008). Agenda-driven creationism is spreading over the world, making very difficult the teaching of Darwinian evolution to those that already held creationist views (Calver and Bryant 2017). A study in a private university in Bogotá, Colombia, found that 10% of its students denied that humans have developed from other species (Archila and Molina 2018), while 85% believed the opposite. Thus, it is relevant to expand this study to track and quantify the creationism sentiment/movement in South American countries.

Conclusions

Chilean students/faculty were clearly more agnostic/atheist and acceptors of Darwinian evolution than their Colombian counterparts. Similarly, Chileans were less prone than Colombians to sustain a literal interpretation of the Bible, creationist views, and to accept a role of God in the Universe and the existence of miracles. Both Chileans and Colombians coincided that while science and religion deal with different issues, they can coexist. Academic degree and area differently affected these views in Chile and Colombia, as only in Chile there was a clear tendency among biologists and physicists with higher degrees to hold less religious and creationist views. Marked differences between the history, socioeconomic contexts, and high school and university curricula of both countries might explain our results. Chile has experienced a more secular constitutional imprint and Governments, and an economic growth that Colombia has not, which may explain the significant differences regarding secularism and creationism in both countries. High school and university curricula of both countries need to be further explored as the most probable factor explaining the contrasting results between Chile and Colombia.

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