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The Future of Secularism: a Biologically Informed Theory Supplemented with Cross-Cultural Evidence

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Abstract For over a century, social scientists have predicted declines in religious beliefs and their replacement with more scientific/naturalistic outlooks, a prediction known as the *secularization hypothesis*. However, skepticism surrounding this hypothesis has been expressed by some researchers in recent decades. After reviewing the pertinent evidence and arguments, we examined some aspects of the secularization hypothesis from what is termed a *biologically informed perspective*. Based on large samples of college students in Malaysia and the USA, religiosity, religious affiliation, and parental fertility were measured using self-reports. Three religiosity indicators were factor analyzed, resulting in an index for religiosity. Results reveal that average parental fertility varied considerably according to religious groups, with Muslims being the most religious and the most fertile and Jews and Buddhists being the least. Within most religious groupings, religiosity was positively associated with parental fertility. While cross-sectional in nature, when our results are combined with evidence that both religiosity and fertility are substantially heritable traits, findings are consistent with view that earlier trends toward secularization (due to science education surrounding advancements in science) are currently being counter-balanced by genetic and reproductive forces. We also propose that the inverse association between intelligence and religiosity, and the inverse correlation between intelligence and fertility lead to predictions of a decline in secularism in the foreseeable future. A *contra-secularization hypothesis* is proposed and defended in the discussion. It states that secularism is likely to undergo a decline throughout the remainder of the twenty-first century, including Europe and other industrial societies.

Keywords Religions · Religiosity · Secularization · Parental fertility · Cross-cultural

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The evolutionary future of religion is extinction. Belief in supernatural beings and supernatural forces that that affect nature without obeying nature's laws will erode and become only an interesting historical memory.
Wallace 1966, p. 265

Although the obituary for religion in modern societies has been written many times, there is very little support for the secularization hypothesis.
Hirschman 2004, p. 1207

Introduction

As the term will be used here, *secularism* refers to the idea that as mankind's scientific knowledge continues to grow, thereby explaining more and more of the natural universe and the evolution of life, supernatural (religious) explanations will gradually fade into history (Berger 1967; Bruce 2002;

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Wallace 1966). Other uses of the term have to do with simply keeping any given religion from dominating governmental policies. Without questioning the legitimacy of this latter use of the term, it is not what was meant by those who first began using the term in social science. In particular, several nineteenth century French and German sociologists such as Saint-Simon, Comte, Marx, Durkheim, and Weber all argued that all phenomena, including human affairs, were natural and could be ultimately understood without assuming any supernatural guidance or intervention (Gorski 2003, p. 111). As noted by Stark and Iannaccone's (1994, p. 249), the secularization thesis is central to the very beginnings of sociology. In fact, Comte (1858), sociology's recognized founder, envisioned secularist thought actually replacing religion (Demerath 2003, p. 206).

Over the years, various specific theories have been offered to help explain nuances in the secularization process (Berger 1967; Bruce 2011; Minarik 2014). No attempt will be made here to describe and critique each secularization theory that has been articulated except to note that they all lead one to a similar outcome: As humans become more rational and scientifically enlightened, religiosity will fade. In other words, as scientific knowledge accumulates and is disseminated to the masses, the tendencies for humans to adopt secularist (i.e., non-supernatural) belief systems will gradually supplant religious belief systems (e.g., Barber 2012; Berger 1999; Bruce 2002; Kay 1997; Lechner 1991; Voas 2009; Wallace 1966; Wilson 1982). In contrast to these predictions, several other social scientists have questioned the secularization hypothesis, proposing instead that religiosity shows few signs of actually disappearing and may even be increasing (Berger 1999; Pickel 2011; Stark 1999; Stark and Iannaccone 1994).

Evidence Pertaining to the Secularization Hypothesis

In discussing secularization, it is useful to distinguish between religious affiliation and religiosity. Much of the evidence offered in support of the secularization hypothesis has pertained to the former rather than the latter. For example, religious affiliation appears to have declined in a number of Western countries throughout the twentieth century (Balakrishnan and Chen 1990), especially in European countries (Burkimsher 2014; Crockett and Voas 2006; Davie 1994). When it comes to holding religious *beliefs*—e.g., belief in god, belief in life after death—European trends have also been downward, although less dramatically than in the case of religious affiliation (Berger 1999; Berger et al. 2008; Crockett and Voas 2006; Davie 1994). However, if attention is focused on just the past 15 years or so, Europeans actually appear to have reversed course toward greater religiosity (Kaufmann et al. 2012; Maliepaard et al. 2012; Reitsma et al. 2014).

In the USA, religious attendance and membership rates have remained fairly stable since the middle of the twentieth century (Hirschman 2004; Hout and Greeley 1987). Similarly, the proportion of adults who believe in God, immortality, and other common religious doctrines has changed very little over the past 60 years (Bishop 1999; Chaves 2011; Glenn 1987; Grant 2008). The only notable qualification is a modest increase in the proportion of adult Americans who are atheists, agnostics, and without any religious preference during the past couple of decades (Cimino and Smith 2012; Pew Research Center 2015; Schwadel 2010).

Studies elsewhere in the world, particularly in Asian and Middle Eastern countries, have not found much if any change in religiosity (Groth and Sousa-Poza 2012; Nanda 2011; Pew Research Center 2015). One part of the world where religiosity appears to have actually increased in recent decades is among the former Soviet Bloc countries. For them, a modest-to-strong resurgence of religiosity appears to have occurred (Froese and Pfaff 2005). Russia itself appears to have experienced a substantial swing back toward religiosity following the collapse of the Soviet Union. In 1999, the year of the collapse, 61% of Russians identified themselves as "nonbelievers" (Greeley 1994), but 6 years later, the percentage had dropped to 33% (Dubin 1999).

Failures to find much if any diminution in religious beliefs, especially worldwide, has prompted some social scientists to propose modified versions of secularization theory (e.g., Berger 1999; Demerath 2003; Gorski and Altinordu 2008; Norris and Inglehart 2011; Pickel 2011). Other social scientists have actually suggested that secularization will never occur because religiosity fulfills fundamental spiritual needs for most humans (Greeley 2003; Stark 1999; Stark and Finke 2000). One proponent of this latter view argued that human needs for a spiritual life are actually strong evidence for the *reality* of a supernatural realm (Greeley 2003). Finally, two sociologists have argued that religiosity is promoted not so much by people's needs for religion but by vibrant competition for believers between various religious faiths; i.e., the more a society allows religions to freely compete, the more followers they will attract, and thus the more religious a country will become (Stark and Iannaccone 1994; Iannaccone 1998). The so-called supply-side proposal seems limited in its ability to explain nationwide variation in religiosity given that many of the most religious countries are predominantly Muslim (Hunsberger et al. 1999) where free competition between different faiths is highly restricted (Fargues 2001; Taylor and Horgan 2001). For additional criticisms of Stark and Iannaccone's (1994) supply-side proposal, see McCleary and Barro (2006).

The Role of Intelligence Trends in intelligence also have implications for the secularization hypothesis. There is new evidence that mean IQ is beginning to decline (Sundet et al. 2004; Teasdale and Owen 2008). Based on a century of decline in Iceland in polygenic scores associated with

educational attainment (closely related to intelligence), Kong et al. (2017) estimate that the mean of this score will drop one to three tenths of a standard deviation in the next century. The decline is due to small family size among people with high levels of educational attainment. Since intelligent individuals are somewhat less likely to be religious (Zuckerman et al. 2013), a decline in mean IQ could result in greater average religiosity. Additionally, since intelligent people tend to be less religious and have smaller families, they are predicted to contribute fewer secular people to new generations.

Genetics and Evolutionary Evidence Pertaining to Secularization

We propose that incorporating the findings of biological research into an understanding of secularization trends reveals important insights. In particular, as we will proceed to document, (a) religiosity and intelligence are substantially influenced by genetics and (b) persons with lower IQs and who are most religious are reproducing at substantially higher rates than those who are least religious. Johnson (2012, p. 31) recently suggested that "religious groups are reproducing much faster than atheists" and, for this reason, "the genes of believers will spread in the population at the expense of the genes of atheists." More succinctly, Johnson concluded that "Evolution is favoring believers and selecting out atheism." We believe that his proposal is correct. A foundation for this belief will be provided here in the introduction and then elaborated on in the discussion.

IQ, Religiosity, and Fertility Genetic research reveals that heritability for general intelligence is substantial (Deary et al. 2006). As reported above, individuals with high intelligence tend to be low in religiosity (Zuckerman et al. 2013). Studies worldwide have documented that persons with low intellectual ability have been leaving more descendants in subsequent generations than those with high intelligence (Abdel-Khalek and Lynn 2008; Al-Shahomee et al. 2013; Chen et al. 2013; Hopcroft 2006; Retherford and Sewell 1988; van Court and Bean 1985).

Religiosity and Fertility From an evolutionary standpoint, if a substantially heritable trait is associated with high rates of reproduction, this trait is, ipso facto, being naturally selected (Pinker 2003, p. 50). Regarding religiosity, evidence for it being naturally selected comes from demonstrating positive correlations between religiosity and rates of reproduction. Studies have shown that when highly religious people are compared to those who are non-religious or even moderately religious, the former (a) desire more children (Hayford and Morgan 2008), (b) plan to have more children (Balakrishnan and Chen 1990; Barrett et al. 2014; De Jong 1965), and (c) in

fact do have more children (Frejka and Westoff 2008; Meisenberg 2012; Van Bavel and Kok 2004).

Positive associations between fertility indicators and religiosity have been reported throughout the world. Countries include a variety of traditionally Christian European countries (Adsera 2006; Berman et al. 2012; Murphy and Knudsen 2002; Schellekens and van Poppel 2006; Philipov and Berghammer 2007) and the USA (Hayford and Morgan 2008; Mosher 1985; Zhang 2008, 2011). Similar positive correlations have also been found in traditionally Jewish and Muslim populations (Chamie 1981; Friedlander and Feldmann 1993; Neuman and Ziderman 1986), as well as in predominantly Hindu and Buddhist countries in Asia (Morgan et al. 2002). Thus, it appears that no matter what religion is being considered, a positive religiosity-fertility relationship exists (Alwin 1986; Blume 2009; Frejka and Westoff 2008; Meisenberg 2012; Westoff and Frejka 2007).

Religiosity and Genetics Numerous studies (based primarily on twin designs) have indicated that religiosity is genetically influenced (Bouchard et al. 1999; D'Onofrio et al. 1999; Eaves et al. 2008; Kendler et al. 1997; Koenig et al. 2005). The extent of this influence is substantial, with most heritability estimates being in the .4–.5 range (reviewed by Bouchard and McGue 2003, pp. 29–31; Koenig and Bouchard 2006). However, a more recent study estimated the heritability to only be .26 (Lewis and Bates 2013).

The conclusion that religiosity is substantially heritable needs to be qualified by noting that *which* religion one affiliates with appears to have little if anything to do with genetics (Bouchard and McGue 2003; D'Onofrio et al. 1999). In other words, while genes substantially influence *how* religious one becomes, they do not appear to impact which *specific* religion (or denomination) one gravitates toward. Regarding the psychological processes for genetic influences on religiosity, a recent study suggested that those who are most religious exhibited unusually strong desires for integrating into a stable communal type of environment (Lewis and Bates 2013).

Fertility and Genetics Besides influencing religiosity, genes also appear to impact fertility. Relevant studies include those indicating that the number of children couples have is genetically influenced (Bras et al. 2013; Christensen et al. 2003; Murphy and Knudsen 2002; Rodgers et al. 2001). Even desired and expected numbers of children have been shown to be significantly heritable (Kohler et al. 1999, 2006; Rodgers and Doughty 2000).

One might wonder why fertility would be heritable. Wouldn't we expect natural selection to remove all genetic variance in fertility? Rodgers et al. (2001) proposed that genetic variation in fertility could might be maintained by several factors: (1) changes in societal norms for sexual attraction, (2) changes in marriage and cohabitation patterns, (3) changes

in norms for family size, (4) changes in the availability of induced abortion, and (5) changes in contraception innovation.

How Religiosity and Fertility Are Related There is evidence that both religiosity and fertility are significantly heritable, but how are they related to either? Evolutionary researchers disagree over whether religiosity is either an adaptation or a combination of characteristics that piggyback on actual adaptations (Sanderson 2008). The conventional social science explanation is that religions typically teach and encourage pronatalist and traditional gender norms and discourage strategies of fertility control such as contraception, sterilization, and abortion (McQuillan 2004). While there is empirical support for such a view, there is evidence that genetically influenced personality traits, particularly agreeableness, lead to greater religious involvement, larger family size, and greater communal investment in general. Agreeable individuals are characterized by such traits as trust, compliance, and tender-mindedness. A recent meta-analysis of a large sample of studies found that adults who score high on agreeableness (and to a lesser extent conscientiousness, emotional stability, and low psychoticism) tend to invest heavily in both religious and family life (Lodi-Smith and Roberts 2007). Agreeableness is moderately heritable (Jang et al. 1996) and might help explain the robust association between religiosity and fertility.

The Present Study

The main objective of this paper is to build a biologically informed prediction that counters the secularization thesis. The portion of our paper devoted to analyzing available data is to reinforce the research literature drawn upon to make our prediction. The present study is not intended as a definitive, formal test of the secularization thesis. More precisely, we examine how persons with various religious beliefs and affiliations are the descendants of parents with varying degrees of fertility. To the extent that secularization is occurring, we hypothesize that religiosity should be inversely correlated with parental fertility, and we expect this to be the case across countries and religious groups.

Methods

Undergraduate college students in Malaysia and the USA comprised the samples for this study. The 2059 Malaysian students were all attending the University of Malaya (in Kuala Lumpur) while the US students were attending the following eight universities: Boise State University in Idaho (145 respondents), California State University at Fullerton (251 respondents), Evangel University in Missouri (264 students), Minot State University in North Dakota (173 respondents), Pennsylvania State University (110 respondents), the University of Missouri (258 respondents), the University of Texas in the Permian Basin (1048 respondents), and the University of Texas in San Antonio (261 respondents), for a total of 2511 respondents. As a qualifying comment on the sampling process, approximately 300 of the 1048 UTPB sample were recruited by students attending UTPB, some of whom were not college students themselves, but all were at least 18 years of age.

The questionnaire was developed and refined in English. It was then translated into Bahasa Malaysia, Malaysia's official language. To help ensure that the Malaysian translation was equivalent to the English version, the Malaysian questionnaire was back-translated into English until all discrepancies were eliminated. Both questionnaires were four pages in length and covered a wide variety of topics, only a few of which are part of the present study.

Demographics of the Two Countries Sampled

Table 1 shows the means and proportional distributions of key demographic variables for respondents in both countries. Because our sample predominantly consisted of college students, no claim can be made regarding the representativeness of either sample. The only qualification to our describing the sample as consisting of college students is that in one university—the University of Texas in the Permian Basin—approximately 300 of the respondents were actually recruited by university students who themselves had completed a questionnaire, and may not have been university students themselves but were at least 18 years of age.

The sex proportions in our sample were decidedly in favor of females for both countries. A major reason for this is that more females are currently attending college in both Malaysia and the USA (DiPrete and Buchmann 2006; Firebaugh and Dorius 2010).

Regarding social status, Table 1 shows that there were substantial differences between the Malaysian parents and the US parents, with the latter averaging roughly 2 years more of education. To obtain information regarding income variations, each respondent was asked to estimate his or her family's income using a scale from 1 (extremely low) to 10 (extremely high). According to Table 1, the average for the US students was 6.04, compared to 4.77 for the Malaysian students. Thus, in terms of both years of education and family income, the US students had substantially higher social status background than did the Malaysian students.

As one would expect, there are tremendous ethnic differences in the two countries sampled. Table 1 shows that not a single respondent in our Malaysian sample identified themselves as White, Black, or Hispanic. In the US sample,

Table 1 The demographics of the sample and the means and proportional distributions for the independent and dependent variables

Demographic traits	Malaysian sample (numbers and %, or means and SDs)	US sample (numbers and %, or means and SDs)	Total sample (numbers and %, or means and SDs)
Gender			
Males	652 (31.7%)	1027 (40.9%)	1679 (36.7%)
Females	1406 (68.3%)	1484 (59.1%)	2890 (63.3%)
Total	2058	2511	4569
Age			
Mean (and SD)	20.87 (2.36)	23.96 (9.27)	22.57 (7.22)
Range	18–42	17–81	17–81
Total	2029	2511	4569
Marital status			
Single	1969 (95.7%)	(%)	3936 (88.0%)
Married	37 (1.8%)	(%)	375 (8.4%)
Divorced/separated	1 (0.0%)	(%)	62 (1.3%)
Engaged/domestic partnership	1 (0.0%)	(%)	30 (0.7%)
Widowed	0 (0.0%)	(%)	3 (0.1%)
No response	50 (2.4%)	(%)	131 (2.9%)
Total	2058	2511	4569
Social status background (mean and SD)			
Mother's years of education	10.04 (3.87)	12.57 (4.44)	11.47 (4.38)
Father's years of education	10.78 (3.95)	12.62 (4.81)	11.80 (4.54)
Estimated family income (scale range: 1–10)	4.77 (1.50)	6.04 (2.39)	5.47 (2.14)
Ethnicity			
White/European ancestry	0	1394 (55.5%)	1394 (30.5%)
Black/African ancestry	0	173 (6.9%)	173 (3.8%)
Hispanic/Latin/Native American	0	745 (29.7%)	745 (16.3%)
Native Malays/Bumiputera/Indonesian	1474 (71.6%)	5 (0.2%)	1479 (32.4%)
East Asian (Chinese, "Asian" in USA)	477 (23.2%)	66 (2.6%)	543 (11.9%)
Other Asian (primarily Indian)	85 (4.1%)	51 (2.0%)	136 (3.0%)
Other (Mixed, Arabic, Euro-Asian)	3 (0.1%)	67 (2.7%)	70 (1.5%)
No response	19 (0.9%)	4 (0.4%)	29 (0.6%)
Total	2058	2511	4569
Religious groupings			
Buddhism	375 (18.2%)	12 (0.5%)	387 (8.5%)
Catholic	0[a]	666 (26.5%)	666 (14.6%)
Christian (except Catholic in the USA)	131 (6.4%)	1315 (52.4%)	1446 (31.6%)
Hinduism	71 (3.4%)	5 (0.2%)	76 (1.7%)
Jewish	0	16 (0.6%)	16 (0.4%)
Muslim	1434 (69.7%)	35 (1.4%)	1469 (32.2%)
None/atheist/agnostics, etc.	15 (0.7%)	367 (14.6%)	382 (8.4%)
Other	0	10 (0.4%)	10 (0.2%)
No response	32 (1.6%)	85 (3.4%)	117 (2.6%)
Total	2058	2511	4569
Mean religiosity measures (and SD)			
Belief in god (supreme-being)	8.71 (2.26)	8.12 (3.11)	8.39 (2.77)
Belief in immortality (life after death)	7.77 (3.20)	6.99 (3.53)	7.33 (3.41)
Importance of religion to your daily life	7.70 (2.39)	5.75 (3.40)	6.63 (3.14)
Religious fundamentalism	8.11 (2.30)	5.13 (3.47)	6.49 (3.34)
Obey the teachings of a specific religion	7.54 (2.33)	5.06 (3.50)	6.19 (3.27)

Table 1 (continued)

Demographic traits	Malaysian sample (numbers and %, or means and SDs)	US sample (numbers and %, or means and SDs)	Total sample (numbers and %, or means and SDs)
Active in religious observances	7.22 (2.42)	4.89 (3.47)	5.94 (3.26)
Religious strictness of parents	8.16 (1.96)	5.11 (2.90)	6.48 (2.94)
Total	2058	2511	4569
Parental fertility			
Mean	5.08 (2.87)	3.20 (1.70)	4.05 (2.49)
Range	1–16	1–13.5	1–16
No or unintelligible response	8	45	53
Total	2058	2511	4569

[a] In the Malaysian questionnaire, few respondents who were Christian identified themselves any more specifically than that. Thus, no attempt was made to distinguish between Catholics and other Christians in coding the Malaysian data

however, 94.1% of the respondents classified themselves within one of these three categories.

The Independent and Dependent Variables

Religiosity Each of the seven religiosity questions were measured by asking participants to respond using an 11-point scale ranging from 0, meaning "not at all", to 10, meaning "the most extreme degree possible." These seven particular religiosity items were chosen because they were considered as being applicable to essentially all religions. The seven items were as follows:

> Belief in god (supreme-being)
> Belief in immortality (life after death)
> Importance of religion to your daily life
> Religious fundamentalism
> Obey the teachings of a specific religion
> Active in religious observances
> Religious strictness of parents while growing up

To construct an index of religiosity, principle component factor analysis was performed. Results are shown in Table 2. Based on a recommendation by one of the reviewers, we also performed a second factor analysis based on just three of the seven variables (i.e., belief in God, importance of religion, and obey the teachings of a specific religion). As one can see, both the seven-variable factor loadings and the three-variable loadings are quite strong (i.e., all higher than .50), with the latter loadings averaging slightly higher than the seven-variable loadings. The lowest loading on the seven-item religiosity factor was belief in immortality. As reported by others, this suggests that religiosity is motivated less by desire for "eternal life" than by the active communal aspects of sharing common religious values and beliefs (Ellis et al. 2013;

Kendler et al. 1997). The Pearson correlation coefficient for the seven-item and three-items indexes are .97 which suggests the two measures are essentially empirically indistinguishable. Henceforth, we will report only the results for the three-variable factor and call it the *religiosity index* (Cronbach's alpha = .87). (Alphas were calculated for each country sample, and for each religious group, and were found to be very similar.)

Religious Groupings To determine religious affiliation, respondents were provided with an empty line onto which they were asked to write the religion to which they belonged (if any). All responses provided by the respondents were coded into one of the following nine religious groupings:

> Buddhism
> Catholicism
> Christianity other than Catholicism (in Malaysia, all Christians were grouped together)
> Hinduism
> Judaism
> Muslim
> None/Atheism/Agnosticism, etc.
> Other
> No response

In the US sample, all Christians other than Catholics were grouped together because of the relatively small numbers Orthodox Christians, Mormons, and the numerous Protestant denominations. Also included in this category were respondents who simply wrote "Christian" as their affiliation.

Parental Fertility Respondents were asked to report the number of siblings as well as half-siblings that they have. To calculate family fertility, each sibling was counted as one and each half-siblings was counted as .50 in addition to one

Table 2 Results from performing component factor analysis with seven-item and with three-item religiosity measures

Religiosity variables	Factor loadings	
	7-variable solution	3-variable solution
Belief in God (supreme-being)	.751	.940
Belief in immortality (life after death)	.572	–
Importance of religion to one's daily live	.926	.916
Religious fundamentalism	.885	–
Obey the teachings of a specific religion	.921	.829
Active in religious observances	.913	–
Religious strictness of parents	.698	–

The Cronbach's alpha for the three-item factor was .87 and that for the seven-item factor was .91. In the present analysis, the three-item measure was utilized

automatic count for the respondent himself/herself, a methodology similar to ones utilized elsewhere (Ellis and Hamon 2004). The specific formula was:

$$\text{Parental Fertility} = \text{Respondent} + \text{Siblings} + \text{Half−Siblings } (.50)$$

Obviously, parental fertility cannot be equated with the fertility of couples, of women, or of populations (the most common bases for operationalizing fertility). The main distinction between these more common fertility measures and ours is that our measure over-estimates fertility by excluding all childless couples from being counted.

Studies have found childlessness in most developed countries ranging between 8 and 15% of adults, some of which is voluntary and others involuntary (Gurunath et al. 2011; Mosher 1985; Tolnay and Guest 1982). When comparisons are made between developed and developing countries, voluntary childlessness is highest in Europe and North America, while involuntary childlessness is most pronounced in developing countries (Keizer 2010; Mascarenhas et al. 2012). Overall, our parental fertility estimates of 4.02 is considerably higher than population fertility estimates because it omits all childless couples from being sampled.

With respect to parental fertility according to country, Table 1 shows that the fertility rate is much higher in the Malaysia sample (5.08) than in our US sample (3.20). As later analysis will show, this appears to largely reflect the high proportion of Muslims contained in our Malaysian sample.

SES Statistical Controls

Some of our analysis included controlling for parental social status. To measure parental social status, each student respondent was asked to report the years of education for both of their parents and to rate their family's income on a scale from 1 (meaning "very low") to 10 (meaning "very high"). When SES was controlled, all three of these indicators were individually introduced into the equation.

Data Analysis

As noted above, factor analysis was used to identify any underlying factor structure(s) for our religiosity measures. Average parental fertility was calculated for nine religious groupings (with the last three groupings being those of "none," "other," and "no response"). Pearson correlation was used to determine which religious groups had the strongest relationships between the respondents' degrees of religiosity and their parent's fertility.

Results

Averages on the religiosity factor are shown in Table 3 for both countries separately and combined. If one examines the totals for all of the religions at the bottom of the table, one sees that the Malaysian students were much more religious than the US students. In fact, for the US sample, all but one of the religiosity factor scores were negative. Most religious of all for the Malaysian sample were Muslims, followed by Hindus. Even the Muslims in the US sample were relatively nonreligious when compared to Muslims in Malaysia. Predictably, the group of Malaysians who scored the lowest in religiosity were atheists (including "none," agnostics, etc.).

Table 4 shows the average parental fertility according to religious affiliation (or lack thereof) for the two countries, both separately and combined. As one can see, the fertility of parents of the Malaysian students was substantially higher than the fertility of the US students.

Within both countries, the most fertile religious grouping was Muslims. In Malaysia, the parents of the Muslims average 5.89 children and in the USA, the average was 4.29. The second most fertile parents in Malaysia were Hindus with 4.01 children, but the small sample of just five Hindus

Table 3 Average religiosity scores for each religious groupings for Malaysia and the USA separately and for the two countries combined

Religious groupings	N	Average degree of religiosity (and SD)		
		Malaysia	USA	Malaysia and USA combined
Buddhists	385	−.528 (.809)	−.946 (1.037)	−.540 (.818)
Catholics (USA only)	661	–	−.199 (.849)	−.199 (.849)
Christians (excluding Catholics in the USA)	1421	.339 (.807)	.111 (.874)	.132 (.870)
Hindus	72	.491 (.734)	−.187 (.926)	.444 (.761)
Jews	15	–	−.647 (1.274)	−.647 (1.274)
Muslims	1441	.585 (.521)	−.076 (1.052)	.569 (.549)
None, atheists, agnostics, etc.	375	−.947 (1.040)	−1.683 (.924)	−1.654 (.938)
Other	10	–	−.339 (.925)	−.339 (.925)
No response	86	−.537 (1.112)	−.939 (.954)	−.790 (1.028)
Total	4463	.333 (.775)	−.275 (1.079)	.000 (1.000)

students in our US sample actually had the lowest fertile of all the religious groupings sampled (i.e., 2.40).

Parents of the Malaysian students who considered themselves to be atheists, agnostics, or otherwise unaffiliated with any religion had an average of 3.67 children, while parents of US students with no religious affiliation had 3.04 children. Both of these numbers are below the overall averages for both countries (i.e., 5.08 children for Malaysia and 3.20 children for the USA).

In terms of how parental fertility and respondent religiosity are related, the pertinent evidence appears in Table 5. At the bottom of the table, one can see that the overall correlations were substantial and positive, even after controlling for parental social status (i.e., $r = .271$ without controls and $r = .264$ with controls). These coefficients suggest that religiosity is related to human fertility to a substantial degree.

However, it is interesting to note that the fertility-religiosity correlations vary considerably according to the nine religious groupings. The strongest correlation was among Jews ($r = .564$ without SES controlled and $r = .513$ with SES controlled). Although our sample of Jewish respondents was small (only 16), these results indicate that orthodox Jews are much more fertile than their secular counterparts.

It is rather surprising that even among students with no religious affiliation and students who left the religious affiliation question blank, *religiosity* was correlated with parental fertility. The only religious group for which negative correlations between fertility and religiosity were found were 10 US students who affiliated with "Other." However, because their sample was small ($N = 10$), this coefficient was not statistically significant.

Overall, for members of most established religions, the extent to which they were religious was positively correlated with the fertility of their parents. If one combines this finding with the extensive evidence reviewed in the introduction that

Table 4 Average parental fertility according to religious groupings for Malaysia and the USA separately and with the two countries combined for the nine religious groupings

Religious groupings	N	Average parental fertility (and SD)		
		Malaysia	USA	Malaysia and USA combined
Buddhists	387	2.91 (1.61)	3.71 (1.76)	2.94 (1.62)
Catholics (USA only)	666	–	3.42 (1.83)	3.42 (1.83)
Christians (excluding Catholics in the USA)	1446	3.46 (2.01)	3.11 (1.61)	3.14 (1.65)
Hindus	76	4.01 (1.72)	2.40 (.55)	3.90 (1.72)
Jews	16	–	2.94 (1.34)	2.94 (1.34)
Muslims	1469	5.89 (2.86)	4.29 (2.53)	5.85 (2.86)
None, atheists, agnostics, etc.	382	3.67 (3.62)	3.04 (1.65)	3.06 (1.76)
Other	10	–	2.60 (1.05)	2.60 (1.05)
No response	117	3.69 (2.25)	3.16 (1.43)	3.36 (1.78)
Total	4569	5.08 (2.87)	3.20 (1.70)	4.05 (2.49)

Table 5 Correlations between religiosity and parental fertility (without and with controls for parental social status) according to the nine religious groupings

Religious groupings	Correlation between the religiosity factor and parental fertility for Malaysia and USA combined	
	Zero-order	SES controlled
Buddhists	.035	.026
Catholics (USA only)	130**	.131**
Christians (excluding Catholics in the USA)	.034	.029
Hindus	.206*	.184
Jews	.564*	.513*
Muslims	.117***	.110***
None, atheists, agnostics, etc.	.247***	.226***
Other	−.197	−.218
No response	.264*	.251*
Overall	.271***	.264***

both religiosity and fertility are substantially influenced by genes, one can deduce that over the long term, secularization is not likely to replace the popularity of religion. Instead, over the long term, we predict that the most religious "shall inherit the earth," so to speak. This is especially so for the most fertile religious groups—Islam.

Discussion

For over a century, social scientists have predicted that secularist/scientific thinking will eventually replace religious/supernatural thinking as humans become better educated and thereby more rational and scientifically astute (Barber 2012; Berger 1999; Bruce 2002; Comte 1858; Kay 1997; Voas 2009; Wallace 1966). Most of the empirical support for this prediction has come from Europe, where declines in religious involvement and at least modest declines in conventional religious beliefs have been documented throughout much of the twentieth century (Burkimsher 2014; Davie 1994). In the USA, after decades of relative stability (Marty 1982), there appears to have also been a modest decline in religiosity since the mid-1990s (Groth and Sousa-Poza 2012; Pew Research Center 2015). Elsewhere in the world, most of the trends in religiosity have either been upward, such as in the former Soviet Union and its satellites (Hirschman 2004; Grant 2008), or more or less stable, such as in Asia and the Middle East (Chaves 2011; Froese and Pfaff 2005; Glenn 1987; Grant 2008; Greeley 1994). Even in European countries, the trends in religiosity seem to have been mixed since the 1990s (Borowik 2001), with modest increases so far in the twenty-first century (Kaufmann et al. 2012; Pollack 2008). Overall, it is difficult to cite survey data that makes a clear case for any long-term trends toward secularism. Moreover, in analyses that go back to medieval Europe, social historians claim that

contemporary religious involvement in Western countries is not lower than in prior centuries (Greeley 2003; Stark 1999).

Capsulizing the Present Study's Findings and Identifying Its Strengths and Weaknesses

This aim of the present study was not to conduct a formal test of the secularization hypothesis, but to develop a competing prediction based on available data and biologically informed research. As expected, our findings suggest that parental fertility is positively correlated with the religiosity of their offspring (Table 4), and this positive association even held true within most religious groupings (Table 5).

The main strengths of the data analysis are that it was based on large samples drawn from two quite different countries, and it is the first analysis to have simultaneously measured religiosity within a variety of specific religions. This allowed us to examine how religiosity apart from any specific religious affiliation correlates with fertility across two generations.

Five notable limitations need to be acknowledged. One is the fact that the study was largely confined to college students. Broader samples for a greater number of countries would obviously have been desirable. Nevertheless, the two countries themselves provided a fairly extensive representation of today's major religious groupings.

Another limitation was that the study's methodology prevented us from obtaining any information about cohorts in the parental generation who remained childless. It is possible that childless couples are more prevalent in some religions than others in ways that could substantially alter some of our conclusions.

A third limitation is that our data were cross-sectional even though the secularization hypothesis is obviously longitudinal. Nevertheless, the positive correlations between religiosity and fertility reported here are consistent with our hypothesis

and not with the secularization hypothesis is possible by showing that religiosity and fertility are positively correlated.

Fourth, all seven of our religiosity measures were rather general so that they could be answered by anyone, regardless of religious affiliation. Many, if not most, other studies designed to measure religiosity in depth have asked questions that are only pertinent to one or more specific religions (e.g., faith in Jesus, belief the Bible is literally true), and consequently have found two or more religiosity dimensions (e.g., De Jong et al. 1976; Kendler et al. 1997; Neff 2006). We are not disputing the validity of these more in-depth studies. Instead, our main interest was in determining if general religiosity varied by major religious groupings and with fertility. For this purpose, we feel that our indexes were sufficient. Nevertheless, it would be useful in future studies to ask more detailed questions about religiosity, including those that would be specific to members of some religion but not to others.

Fifth, as argued above, another variable is central to understanding variations in secularism: intelligence. Unfortunately, we were unable to obtain any direct measure of intelligence in our questionnaire.

A Biologically Informed Perspective on Secularization

When our study's findings are combined with evidence that genes influence religiosity, fertility, and intelligence, it is possible to foresee the future of secularism in a new light. Even though we accept that secularism has significantly increased over much of the twentieth century in Europe and at least a few other countries in the industrialized world, from our biologically informed perspective, we envision a decline in secularism throughout the remainder of the twenty-first century, especially in industrialized countries.

The main social component regarding the future of secularism involves *the growth in scientific understanding of how the universe functions* (*including the evolution of life*). We believe that the breadth and depth of this knowledge will continue to grow throughout the twenty-first century while the proportion of the world's population who think in secularist terms declines. In other words, we join those who believe that the evidence for a nontheistic understanding of the universe is compelling (Dawkins 2009; Espinosa 2015; Gribbin and White 2016; Power 2012; Stenger 2012). However, due to genetic influences on religiosity, intelligence, and fertility, we predict that declining proportions of the human population will actually accept this type of secularist understanding over the long term. To defend this line of reasoning requires thinking in evolutionary terms, i.e., in terms of differential rates of reproduction. The premises underlying this reasoning are as follows:

1. *Religiosity is substantially heritable* (Bouchard et al. 1999; D'Onofrio et al. 1999; Eaves et al. 2008; Koenig et al. 2005). As mentioned in the introduction, human tendencies to be religious are to a considerable extent genetically influenced, presumably by way of influencing some important aspects of brain functioning. While genes do not appear to have much effect on *which* religion one chooses (Bouchard and McGue 2003; D'Onofrio et al. 1999), they have considerable effect on the degree of commitment people make to religious doctrines and practices (i.e., religiosity) (Bouchard and McGue 2003; D'Onofrio et al. 1999; Eaves et al. 2008).

2. *Fertility is substantially heritable* (Rodgers and Doughty 2000; Rodgers et al. 2001). This appears to be especially true in populations where individuals have knowledge of how conception occurs and have access to effective contraceptives, thereby giving them considerable voluntary control over their reproduction (Kohler et al. 2006).

3. *Religiosity and fertility are positively correlated* (Adsera 2006; Berman et al. 2012; Schellekens and van Poppel 2006; Hackett et al. 2015; Hayford and Morgan 2008; Zhang 2011). Nearly all prior studies documenting this positive correlation have been derived from studying the number of children born to women (or couples). The present study has shown that this positive correlation is even apparent when the religiosity of offspring is compared to the fertility of *their* parents. Also, the strongest religiosity-fertility correlations involved respondents affiliating with Islam.

4. *Intelligence is substantially heritable*. This conclusion has been reached by numerous studies (Burdick et al. 2006; Deary et al. 2006; Erlenmeyer-Kimling and Jarvik 1963; Power and Pluess 2015; Plomin and Spinath 2004; Shakeshaft et al. 2013). The heritability quotient for intelligence appears to be at least .60, which is higher than the heritability quotients for either religiosity (~ .45) or fertility (~ .35).

5. *Intelligence is inversely correlated with religiosity.* Individuals with high intelligence tend to be low in religiosity, although the tendencies are modest in strength, i.e., ~.20 (Francis 1998; Ganzach and Gotlibovski 2013; Lewis et al. 2011; Meisenberg et al. 2012; Nyborg 2009; Razmyar and Reeve 2013; Turner 1980; meta-analysis: Zuckerman et al. 2013). The same pattern was found when average intelligence and average religiosity among countries were correlated (Lynn et al. 2009). Even among scientists, those with the highest average IQs (i.e., physicists) were more likely to doubt the existence of a personal god than scientists with somewhat lower average scores (i.e., social scientists) (Dutton and Lynn 2014).

6. *Intelligence and fertility are inversely correlated*. Because valid measures of intelligence were not available until the early twentieth century, one will never confidently know how intelligence and fertility correlated before then. Nevertheless, since that time, studies throughout the world have shown that persons with low intellectual

ability have been leaving more descendants in subsequent generations than those with high intelligence (Abdel-Khalek and Lynn 2008; Al-Shahomee et al. 2013; Chen et al. 2013; Hopcroft 2006; Retherford and Sewell 1988; van Court and Bean 1985).

Secularism's Future The above six propositions can be combined to make three testable predictions about the future of secularism during the twenty-first century. These predictions are as follows:

Prediction 1: For humanity as a whole, religiosity will increase. This forecast is not simply due to the positive correlation between religiosity and fertility. While the pace at which this prediction unfolds will no doubt vary considerably from country to country, we expect that it will be easily detected in all countries with reliable baseline data by the end of this century.

Prediction 2: Due to the fact that Muslims have the highest reproduction rates of all major religions and are the most religious, Islam will encompass increasing proportions of the world's religious community. Currently, about one fifth of all humans are Muslim. By the end of the current century, and Islam will have surpassed Christianity as the world's largest religion and will comprise over one fourth of all the persons on earth. In addition to Muslims having the highest reproduction rates, Islam retains membership unusually well due in part to harsh sanctions imposed for members renouncing Islam (Pierce 2004).

Prediction 3: As religiosity increases over the ensuing decades, average intelligence will gradually decline. This IQ decline should be most pronounced in countries where IQ is currently relatively high and religiosity is relatively low due partly to the inverse correlation between religiosity and intelligence. An additional contributor to a worldwide decline in IQ is that highly religious people (with high reproduction rates, particularly Muslims) should continue to migrate from their native countries to ones with below-replacement fertility, thereby supplying low religious countries with new citizens who are highly religious. By the end of the twenty-first century, we predict that nearly all of the countries with the highest proportions of secularism will become much more religious in proportional terms and observably lower in average intelligence.

The above three predictions can be subsumed under what we will term the *contra-secularization hypothesis*. In contrast to the secularization hypothesis, which was never offered with specific estimates of how long it would take to materialize, we offer our hypothesis with a specified time frame so that its accuracy (or inaccuracy) can be precisely assessed.

Secularism's Past There are some intricacies of the contra-secularization hypothesis that need special attention. Before doing so, we will offer a brief sketch of what we believe happened historically regarding secularism going all the way back to medieval times.

Readers will see that predicting an increase in religiosity and a decline in secularism throughout the remainder of the twenty-first century does not conflict with evidence already reviewed that religiosity has diminished in many countries over the past century or so. In particular, segments of several countries especially in northern Europe (and possibly in northern Asia and North America) appear to have become much more secular (less religious) during the latter half of the nineteenth century and much of the twentieth century.

To explain these developments, we believe that the main propelling force behind secularism has always been an awareness of advancement in scientific discoveries. This awareness has been driven mainly by the dissemination of scientific research and theorizing among the most intelligent and educated segments of the world's populations. Persons with low intelligence and often those in the average range will be unable to follow these scientific advancements, and the highly religious (even if highly intelligent) will not be able to accept their secularist implications. Thus, the main counter-forces to secularism are religious traditions developed by humans prior the emergence and use of the scientific method. Because religious belief systems are impervious to scientific scrutiny, once created, they can persist indefinitely through family-based social networks. And, because there are substantial genetic tendencies to being religious, and religiosity is positively correlated with fertility, it pervades all human populations. Ironically, now that effective birth control has been developed (using the scientific method), and nonreligious people are more likely to use birth control, their numbers are being overwhelmed by those who are highly religious.

As scientific knowledge has grown, the credibility of key religious doctrines has diminished. Evidence in this regard comes from a report of the proportion of scientists who profess believing in a personal god. In 1914, 27% of scientists expressed having such a belief. When the survey was repeated in 1933, the percentage had dropped to 15%. And in 1998, the percentage was down to 7% (Larson and Witham 1998).

We hypothesize that throughout the medieval period of Western history (circa 500–1600), only minor advancements in science were made and these advancements were insufficient to seriously challenge any of the prevailing religious belief systems. Furthermore, because of the absence of effective birth control, little relationship existed between religiosity and reproduction rates. In other words, even if religiosity was positively correlated with the number of offspring couples

desired—as evidence indicates it is now (Hayford and Morgan 2008; Westoff and Frejka 2007)—the contraception needed to have major effects on fertility rates during medieval times was quite limited. As a result, it seems safe to assume that throughout the medieval period, fertility rates among the highly religious and the minimally religious were small. This allowed genes for minimal religiosity to exist alongside genes for maximal religiosity.

As the medieval period gave way to the Enlightenment (circa 1650–1800), however, the pace of scientific thought and discoveries began to noticeably quicken, giving rise to some of the earliest secularist thinkers (Brooke 1991). By the mid-nineteenth century, secularist thought had become fairly common among European intellectuals, especially at prominent universities. Presumably, secularist thought was then (and still is) largely limited to individuals with (a) genes for unusually high intelligence (i.e., in the upper 15% of the bell curve) and (b) few religiosity-promoting genes. Persons with any other genetic configurations would have rarely felt comfortable reasoning as secularists do. In other words, they will inevitably invoke assumptions that one or more supernatural forces are influencing whatever phenomena they are trying to comprehend.

By the mid-nineteenth century, scientific discoveries had moved to a point that human reproduction was sufficiently well understood that fertility rates began to be impacted, especially in the emerging industrial countries (Morgan 1991). Research indicates that the individuals who were most successful in curtailing their fertility during this time were the most highly educated (Meisenberg 2009; Woodley and Meisenberg 2013) and the least religious (Lesthaeghe and Wilson 1986). Thus, for the first time in human history, secularists began to curtail their reproduction much more than the highly religious segments of these countries.

The pace at which secularists curtailed their fertility accelerated even more in the mid-twentieth century with the dissemination of extremely effective contraceptives (McLaren 1990). Studies have shown that the individuals who utilized contraceptives the most since the mid-twentieth century are the most highly educated and the least religious (Blake 1979; Bloom and Pebley 1982; Finer and Zolna 2011) (i.e., the secularists). As a result, secularists have been reproducing at rates lower than the most religious countries for over a century, but especially since around the middle of the twentieth century. Therefore, the genes that are most conducive to secularist thinking (i.e., those for high intelligence and low religiosity) are gradually declining in proportional terms, especially in the most advanced industrial countries.

It is ironical that effective birth control methods were developed primarily by secularists, and that these methods are serving to slowly diminish the proportional representation of secularists in forthcoming generations. In other words, the genes conducive to secularism are now evidently being reduced in human populations relative to genes for high religiosity and low intelligence.

Elaborating on the Current State of Secularism and Its Future

Having sketched out our predictions for the future of secularism and explained how we think it got to the present point, three related issues will be explored in more detail. The first has to do with trends in human intelligence. The second delves into how Europe and the USA diverged regarding the prevalence of secularism. Third, the spread of Islam is given attention as the religion that will expand in the twenty-first century.

Trends in Average Intelligence One reason we expect secularism to gradually decline at least in Western countries over the remainder of the twenty-first century is our expectation that average intelligence in these countries will decline noticeably. Some may find this prediction dubious because some scientists have forecasted a decline in human intelligence for over a century (Cattell 1937; Itzkoff 1994), while evidence suggests the opposite has actually transpired. Specifically, research has indicated that there has been roughly a 1-point *gain* in average IQ scores throughout nearly every decade of the twentieth century, at least in industrialized countries (Flynn 1987; Neisser 1997). We accept that this twentieth century gain has occurred, but argue that the increase can be explained without refuting our forecast for a decline throughout the twenty-first century.

Our proposal is that genes for high intelligence were being reduced slightly in frequency throughout most of the twentieth century due to individuals with low IQs reproducing at higher rates than those with high IQs. However, at the *measured* (or *phenotypic*) level, intelligence has increased during the same time because of environmental factors. These factors include better nutrition, reduced environmental hazards such as exposure to lead and other toxins, improved medical care especially in terms of preventing communicable diseases, and more conscientious childhood rearing and better educational practices (Colom et al. 2005; Lynn 1990; Nisbett et al. 2012; Rindermann 2008). Also, because there has been substantial declines in overall fertility throughout the twentieth century, parents have been able to concentrate their child-rearing attention onto fewer offspring (Sundet et al. 2008).

However, we believe that these environmental boosts to average intelligence might be reaching their maximum effective limits, at least in developed countries. If this is true, average IQ scores in the future will for the most part reflect gene distributions, which we hypothesize have been declining for over a century and will continue to do so over the long term. Lynn and Harvey (2008) estimate that the effect of dysgenic fertility has been a decline in global genotypic IQ of 0.9 IQ points for the years 1950–2000, and they project a further

decline of 1.3 IQ points in the world's genotypic IQ over the 2000–2050 period. From 1950 to 2000, the researchers found that the decline was compensated for by a rise in phenotypic intelligence, but this trend is now going into reverse in developed countries. They predict that these negative trends will spread to low-income countries, and the world's population will move into a period of declining genotypic and phenotypic intelligence.

The decline in IQ at the genetic level in Western countries is evidently due to both greater fertility by low-IQ couples than high-IQ couples and to migration from low-IQ countries to high-IQ Western countries (Nyborg 2012). Preliminary evidence from a few countries are already pointing toward a general decline in IQ scores in the past decade (Sundet et al. 2004; Teasdale and Owen 2008). Meisenberg (2009) estimated that currently there is a 1.3 points per generation decline in genotypic intelligence among the youthful world population. A new study finds a significant reduction in polygenic scores associated with educational attainment over the past century in Iceland, and based on this predicts a large decline in these scores over the next 100 years (Kong et al. 2017).

Secularism in Europe versus the USA Given the leadership that the USA has exhibited in scientific research and innovation during the twentieth century (Crescenzi et al. 2007; Noble 1979), it is puzzling that this country is also the most religious of all industrialized countries (Lippy 1994; Reimer 1995). Why did Europe in particular become considerably more secularized than the USA during the twentieth century while, by most measures, the USA surpassed Europe in scientific breakthroughs? We offer a three-part proposal for future exploration of this conundrum:

First, due to its broad mix of racial and ethnic groups, the USA was forced to absorb and accommodate multiple cultural traditions. This mixing of traditions and customs is almost certainly responsible for some of the innovations in the USA relative to countries of roughly equal average intelligence. Nonetheless, it should be noted that the average IQ for European citizens is slightly higher than the US average (Fuerst and Kirkegaard 2016; Vanhanen 2012), which in turn could account for at least some of the greater degree of religiosity in the USA.

Second, while it is difficult to empirically demonstrate, the millions of Europeans who immigrated to the USA were probably not a random sample of Europeans. In particular, the migrants to the USA may have carried higher proportions of religiosity-promoting genes than the Europeans who remain in their home countries. This religious selectivity could have reflected a desire by highly religious segments of Europe to live where their particular type of intense religiosity would have been better tolerated (Lambert 2010). Once settled in the USA, the migrants would have been able to reproduce and feed more offspring than the Europeans who remained

behind. If the most religious US immigrants reproduced at higher rates than the less religious immigrants, genes for religiosity would have spread even more prolifically in the USA than in Europe. This is obviously speculative, but it could one day be tested if some of the specific genes for religiosity are ever identified.

The third element in our proposal involves the concept or *hybrid vigor* or *heterosis*. A trait is said to be *heterotic* if it is more pronounced in the offspring than in the average for both parents. Heterotic traits are thought to be caused by inhibiting the expression of recessive alleles of parents who do not share the same recessive alleles (Jensen 1998, p. 327). Heterosis presumably occurs for traits regardless of whether the traits are being naturally selected; thus, they can both promote and inhibit future reproduction rates. The more distantly related parents are to one another, the less likely they will share the same recessive alleles, i.e., the more heterotic their offspring are likely to be.

It is safe to assume that mating patterns conducive to heterosis would have been unusually high for the offspring of persons immigrating to the USA due to the widespread mixture of their parent's in both ethnic and racial terms. As a result, US citizen would have been more likely to express all sorts of heterotic traits than is true for most citizens of Europe. We do not know what the phenotypic effects of this greater heterosis would have been, but it is conceivable that much of the imaginative "genius" of US scientists and investors over the past couple of centuries was at least partly a reflection of genetic heterosis.

Furthermore, we think it is possible that some of the elevated religiosity found in the USA could also be attributed to genetic heterosis. Thus, even though the average IQ of US citizens appears to be lower than the average for European citizens, their high genetic diversity could have contributed to hybrid vigor responsible for both innovative genus and greater religiosity.

The Growth of Islam in the Twenty-First Century The last issue to be given detailed attention regarding secularism's future involves Islam. This religion is predicted to replace Christianity as the largest religion in the world by the middle of this century and go on to envelop a third of earth's entire population by century's end (Kettani 2010). Table 4 shows what other researchers have confirmed: Muslims have considerably higher fertility rates than members of any other major religion (e.g., Coleman 1994; Frejka and Westoff 2008; Morgan et al. 2002). This is true whether Muslims are living in an Islam-majority country or elsewhere (Westoff and Frejka 2007).

While there may be multiple causes of high Muslim fertility, we believe that one important factor is the unusually high degree of religious fundamentalism among Muslims, higher in fact than any other religion (Ellis in submission; Westoff and Frejka 2007). Before fertility could be voluntarily controlled,

fundamentalism may have made little difference in terms of fertility, but now the impact of fundamentalism on fertility is substantial (Frejka and Westoff 2008). Because Muslims are more fundamentalist on average than members of any other religion, Muslims will continue to reproduce at relatively high rate. Above all, their fertility rate will greatly surpass that of secularists (Kaufmann et al. 2012; Mosher et al. 1992).

We hypothesize that the growing prevalence of Islamic fundamentalism, as with religious fundamentalism in general, is mainly due to fundamentalists carrying higher than average proportions of religiosity-promoting genes and lower proportions of intelligence-promoting genes. Such a proposal would also help to explain why the contributions that Muslims make to science appears to be quite low (Segal 1996).

Another consequence of high fundamentalism is antagonism toward secularist thinking. Muslims are likely to exhibit this antagonism in many ways as their proportional representation in countries continues to grow. For example, in Bangladesh several atheist bloggers have been killed in recent years (Shaffer 2015). Even though Muslims are still in the minority in Europe, Muslim attacks on secularist commentators in France, Norway, and the Netherlands have already been occurring (Prins and Slijper 2002). As the numbers of Muslims in these countries continues to grow, we hypothesize that these sorts of attacks are likely to become more common. Because belief in a personal god is central to Islam and violence toward nonbelievers is explicitly sanctioned by the Koran (Ellis in submission; Venkatraman 2007), the relations between fundamentalist Muslims and secularists is likely to continue to be fraught with tension over the long term. As Muslim representation in Europe and elsewhere continues to grow, we would not be surprised to see pressure to mount on educational institutions to avoid hiring professors or even offering courses with content that are insensitive to Islamic values.

The speculative nature of the above paragraph needs to be emphasized. Some may question our hypotheses by noting that Muslims migrates to non-Muslim countries will gradually moderate their religious views in ways that more closely reflect the views of their host countries (Bruce 2011; Van Tubergen 2006). Our predictions might prove to be inaccurate if the cultural forces of secularization are stronger than we estimate. It is true that there has been a long-term decline in magical beliefs in the West (Thomas 1970). We doubt, however, that culture will prevail in the end because of the long-term power of genes. We also expect major religions to adapt themselves to reduce tension with dominant contemporary worldviews, as they have tended to do.

The empirical evidence currently available on the above issue is somewhat mixed. On the one hand, two studies have indicated that Muslim immigrants into Europe have moderated their religious views to a significant degree (Phalet et al. 2008). On the other hand, a recent study found that second generation Muslims in the Netherlands were attending religious services even *more* frequently in 2005–2006 (the latest figures available) than was reported by their parent a generation earlier despite the fact that the current generation was better educated (Maliepaard et al. 2012). Overall, the chances of Muslims shifting significantly toward secularism seem unlikely. Also, as the proportion of Muslims continues to grow in currently non-Islamic countries (see next paragraph), the need for these countries to accommodate Islamic values is likely to rise.

Regarding Muslim reproduction rates among migrants to Muslim-minority countries, studies have shown that the rates are lower than for Muslims residing in Muslim-majority countries, although still substantially greater than the rates for natives living in the host countries (Coleman 1994; Westoff and Frejka 2007). One illustration of this point was contained in an article published in *The Times* of London. It reported that there were 1.6 million Muslims living in Britain in 2001. Within a decade, that number grew to 2.7 million, a 69% increase (Kerbaj 2009). The article goes on to report that some of this growth is due to Muslims continuing to migrate to Britain, but that most of the increase is due to their having substantially higher birth rates. A report on the future of Europe written even before the recent surge of migrants triggered by the extended Syria's Civil War stated that Europe's "de-Christianization" is actually *not* the result of growing "scientific humanism"; it is due primarily to the growth of Islam (Jenkins 2006, p. 521).

The Essential Predictions

Overall, religious people out-reproduce secularists, and this is especially true for those who are strongly fundamentalist, which, as noted above, is the case for Muslims more than any other major religion. We predict that as the number of Muslims continues to grow, intra-Muslim conflicts and the depletion of resources in Muslim-majority countries will continue to drive Muslim migrants to what are currently non-Muslim countries. As their representation in these countries grows, governments and educational institutions are likely to become increasingly pressured to accommodate Islamic traditions. Many of these traditions conflict with the free exchange of secularist ideas, especially in the sciences.

Underlying all of the above-described cultural transformations that we predict for the remainder of the twenty-first century are the gradual changes in gene frequencies. In particular, as the world becomes more religious, especially in fundamentalist terms, the genes promoting religiosity will spread and the genes for intelligence will diminish. Consequently, the proportion of secularists in most if not all countries will decline noticeably. One possibility for predicting otherwise would come if unforeseen breakthroughs were to be made in biologically engineering greater intelligence and/or lower religiosity.

Conclusions

As noted in the above discussion, secularism is at the heart of advances in scientific understanding of the universe (Dawkins 2009; Espinosa 2015; Gribbin and White 2016; Power 2012; Stenger 2012). Nevertheless, we predict that the proportion of the world's population that thinks in secularist ways is likely to experience an observable decline over the next century. The main reasons involve the prevalence of religiosity and intelligence, two genetically influenced traits that are being impacted by differential rates of fertility. Our research findings, as well as findings from other studies, show that fertility is positively correlated with religiosity even *within* major religious groupings. Other studies have shown that fertility is inversely correlated with intelligence. When combined, these associations suggest that religiosity is likely to increase and intelligence will probably decrease as the current century unfolds.

Stated in more philosophical nomenclature, reasoning in logical empirically verifiable terms about phenomena as complex as the forces driving the workings of the universe (including the evolution of life) without invoking supernatural "shortcuts" (e.g., God made it happen.) requires genes for high intelligence and is facilitated by genes for low religiosity. Findings from various sources suggest that individuals with fewer genes for both of these traits will become gradually more prevalent as the current century unfolds. Contrary to the claims of the secularization hypothesis, one probable result is a decline in the proportion of people who approach the world in secularist, scientific terms.

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