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Faith in science, implicit religion, and antipathy to religions:

A study among Christian and non-religious students

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Abstract

Bailey's notion of implicit religion is invoked to explore the conflict between science and religion in the adolescent mind. This conflict is reconceptualised in terms of the theologies of religion. On this account, belief in science (as implicit religion) when adopted as a fundamentalist or exclusive position excludes the validity of other religious belief-systems (in this case explicit religions). This thesis is tested by exploring the effect of an exaggerated, uncritical, and unqualified belief in the inerrancy of science (styled 'scientific fundamentalism') on a hostile and unfriendly attitude toward conventional religions (styled 'antipathy to religions'). Data were provided by a sample of 10,792 13- to 15-year-old students attending schools in the UK who had identified themselves as either religiously unaffiliated or as affiliated with the Christian tradition. After controlling for personal, psychological, and religious factors, the data confirmed a significant positive association between scientific fundamentalism and antipathy to religions. The implications of these findings are discussed for the science education curriculum in schools, arguing that the conflict between science and religion (promoted by an exclusivist position in science) is as damaging for community cohesion as the conflict between different religions (promoted by an exclusivist position in religion).

Keywords: implicit religion, theology of religions, science and religion, scientism

Introduction

Several approaches have been taken to explore the perceived conflict between science and religion as experienced and expressed by adolescents during the years of secondary schooling. A general conclusion that emerges from this literature is that such conflict is far from inevitable. Recent quantitative studies have documented the proportions of students who take the conflict position. For example, drawing on a survey of 109 11- to 14-year-old students in England, Taber, Billingsley, Riga, and Newdick (2011a) found that 26% of the participants agreed with the sentiment 'science and religion disagree on so many things that you cannot believe both'; 28% of the participants agreed that 'religious ideas about how the universe began have been proved wrong by science'; and 22% of the participants agreed that 'a good scientist cannot believe that life was created by God or a higher being'. These figures also show that the conflict position was not taken by all. Taber, Billingsley, Riga, and Newdick (2011b) supported these quantitative findings with data generated by a qualitative study reporting interviews with twelve 13- to 14-year-old students. Another qualitative study conducted in Sweden among 88 students in the last year of upper secondary school (normally 18 to 19 years of age) and reported by Hansson and Redfors (2007, p. 468) concluded that there is 'a great variation of views among students' concerning how the 'contribution from science to our worldview is related to other ways of knowing – in this case religion'. In this study, 'about 60%' of the students expressed a view that science and religion do not exclude each other, but that it is possible to have a scientific view of the universe and at the same time to have a religious conviction. Hansson and Redfors (2006) illustrate the compatibility between a scientific and a religious view by citing the examples of two students, Knut and Ragnar. Knut explains his position, rooted in the Christian tradition:

> Big bang or something like it I believe has happened. But thanks to my Christian belief I think that the power that started it all was God. (p. 368)

Ragnar explains his position, rooted in the Islamic tradition:

> I believe that God is the creator of all of it, which I want to show with the Koran, in which among other things, is written about how the earth came to be. That is Big Bang can also have happened. (p. 368)

Illustrative of the views of the other 40%, Hansson and Redfors (2007) cite the example of Ludvig:

> They [science and religion] exclude each other by describing reality in completely different ways, – contradict each other. (p. 468)

Against this background, the purpose of the present study is to explore and to test the theory that the conflict between science and religion can be explained by interpreting a *certain understanding* of science as itself functioning as an implicit religion. This theory rests on drawing together two fields of study. The first field of study concerns an approach to implicit religion which understands non-traditional religious phenomena functioning as or like a religion. The second field of study concerns an approach to the theology of religions. Not all theologies of religions presuppose a conflict between different religious traditions. Conflict necessarily emerges between religions only when a particular theology of religions is adopted. These two fields of study will be explored in turn.

Implicit religion

Bailey's notion of implicit religion is an intentionally broad and multi-faceted construct which takes seriously the persistence of religious and spiritual worldviews within contemporary British societies, in ways both continuous with and discontinuous from the conventional practice of Christianity (Bailey, 1997, 1998, 2001, 2002). The present study focuses on two core aspects of Bailey's insight into the notion of implicit religion. The first insight concerns how phenomena outside the field of explicit religion may be properly characterised as evidence of implicit religion. The second insight concerns ways in which

theories and methods established within the academic fields of religious studies and theology may be applied to interrogate, to interpret, and to understand the ways in which phenomena (properly identified as implicit religion) function within contemporary society. Both of these insights will be examined in turn.

Establishing what counts as implicit religion

For Bailey, implicit religion may be characterised by (but is not limited to) three key qualities:

> Implicit religion displays *commitment*; it is something to which individuals feel committed. Implicit religion provides *integrating foci*; it is something that draws together the identity of an individual (or a group) and in doing so furnishes meaning and generates purpose. Implicit religion displays *intensive concerns with extensive effects*; it is something that helps to shape a worldview and carries implications for the way in which life is lived. (Francis, Flere, Klanjšek, Williams, & Robbins, 2013, p. 953)

Drawing on this set of three defining characteristics (commitment, integrating foci, and intensive concerns with extensive effects), empirical research concerned with the study of implicit religion has operationalised this concept in three main ways. The implicit religion of contemporary belief-systems and spiritual practices has been operationalised as belief in luck (Francis, Robbins, & Williams, 2006; Francis, Williams, & Robbins, 2006, 2008), belief in the paranormal (Williams, Francis, & Robbins, 2011), commitment to spirituality (Hughes, 2013), commitment to New Age beliefs (Kemp, 2001; Francis, Flere, Klanjšek, Williams, & Robbins, 2013), and personal belief in supernatural forces (Schuurmans-Stekhoven, 2014). The implicit religion of secular activities has been operationalised as the interior life of a British public house (Bailey, 1997), the practice of football (French, 2002), the spirituality of the practice of belly dancing (Kraus, 2009), the personality cult of Prince (Till, 2010),

American commercial sales organisations (Palmisano & Pannofino, 2013), celebrity worship (Aruguete, Griffith, Edman, Green, & McCutcheon, 2014), and straight edge Punk (Stewart, 2017). The implicit religion of more conventional religious practices has been operationalised as the implicit religion of contemporary pilgrimage and ritual (Schnell & Pali, 2013), and the implicit religion of prayer requests (ap Sion & Edwards, 2013; ap Sion & Nash, 2013).

In a series of recent studies, Francis' research group has set out to test the extent to which specific forms and operationalisations of implicit religion actually function in people's lives in ways analogous to specific forms and operationalisations of explicit religion. These studies have been structured by giving attention to two core questions formulated within traditions established in the empirical psychology of religion. The first question concerns properly identifying phenomena that meet Bailey's defining criteria for implicit religion. The second question concerns hypothesising predicted correlates of individual differences in levels of these forms of implicit religion, analogous to individual differences in levels of forms of explicit religion.

The first study in this series, reported by Francis (2013a), drew on the earlier work of Walker, Francis, and Robbins (2010) and Walker (2013) who proposed the belief that 'You don't have to go to church to be a Christian' as a valid indicator of implicit religion within British society. People who hold this belief, they argued, may find that this view of what it means to be a Christian may offer a valid expression of something that displays real commitment, integrating foci, and intensive concerns with extensive effects. Then Francis (2013a) set out to test the extent to which this form of implicit religion served the same psychological functions in people's lives as explicit religion. Francis took as a test case the established empirical finding that explicit religiosity is routinely associated with an enhanced sense of purpose in life (see Francis & Robbins, 2009), and argued that, if implicit religiosity

serves the same function as explicit religiosity, implicit religiosity should also be associated with an enhanced sense of purpose in life. The data supported this view.

In a subsequent study, Francis (2013b) repeated the analytic model established by Francis (2013a) with a different dependent variable. While the first study had focused on an area of positive affect (purpose in life), the second study focused on an area of negative affect (suicidal ideation). Like purpose in life, suicidal ideation has been securely linked with individual differences in explicit religiosity (Robbins & Francis, 2009). However, the psychological mechanisms linking these two constructs with explicit religiosity work in very different ways. While explicit religiosity promotes the sense of meaning and purpose in life, explicit religiosity serves to inhibit suicidal ideation.

The findings from the two studies reported by Francis (2013a) and Francis (2013b) were not identical. In the study of purpose in life both explicit religiosity and implicit religiosity predicted a significantly higher level of purpose in life; in the second study explicit religiosity predicted a significantly lower level of suicidal ideation, but implicit religiosity was not significantly related to suicidal ideation. In other words, implicit religion may not work in the lives of individuals in the same way as explicit religion to offer protection from negative psychological outcomes like negative affect and the sense of despair and meaninglessness.

Building on the two studies reported by Francis (2013a) and Francis (2013b), Penny and Francis (2015) tried to access and operationalise Bailey's notion of implicit religion by a different measure, this time focusing on attachment to traditional Christian rites of passage in terms of baptism, marriage, and death. In this study, they selected as their dependent variable a nine-item scale of attitude toward substances, because empirical studies exploring the relationship between explicit religiosity and substance use tend to demonstrate that higher levels of church attendance are associated with lower levels of alcohol consumption,

drunkenness, and alcohol-related problems among young people and adults (Fawcett, Francis, Linkletter, & Robbins, 2012), as well as lower levels of drug use (Mellor & Freeborn, 2011). Data from the study by Penny and Francis (2015) support the working hypothesis proposed by Francis' research group that (within the operationalisations employed) implicit religion and explicit religion serve similar functions, where both religious variables make a significant contribution to the development of proscriptive attitudes toward substances among young people.

In a further study, Francis and Penny (2016) employed the same measure of implicit religion as that employed by Penny and Francis (2015), but among a different population and with different dependent measures. On this occasion, the sample was defined as participants within the Teenage Religions and Values Survey who checked the religious affiliation category 'none' and the religious attendance category 'never'. Here were young people who were living and growing up outside the sphere of explicit religion. On this occasion, the dependent variables were two measures concerned with psychological wellbeing. These data demonstrated that young people who remained attached to traditional Christian rites of passage (conceived as an indicator of implicit religion) displayed higher levels of psychological wellbeing, in a way consistent with the effects of explicit religion.

Working within this same broad tradition, Francis, McKenna, and Stewart (in press) test the thesis that the apparently growing concern with human rights among young people may function as an implicit religion. They argued that, just as the study of explicit religion distinguishes between religious beliefs and religious practice, so the conceptualisation of concern with human rights as implicit religion may distinguish between belief (in the sense of acceptance of the claims made within the human rights legislation) and practice (in the sense of activism to assert the causes of human rights). They also argued that previously published research had shown that, after controlling for personal and psychological factors, explicit

religion has a positive effect on explaining individual differences in empathy. Drawing on data provided by a sample of 1,001 adolescents in England and Wales between the ages of 15 and 18 years, this study provided further support for Bailey's conceptualisation of implicit religion by demonstrating that belief in human rights and human rights activism are functioning in relation to empathy in the same way as explicit religion.

Faith in science as implicit religion

In the study reported at the 2017 Implicit Religion conference, Francis, Astley, and McKenna (2018) selected a different measure of implicit religion that they styled as a particular kind of faith *in* science conceptualised as 'scientific fundamentalism', the scientistic belief that science is the only sure path to truth, which includes the exaggerated view that science can attain to inerrant and absolute truth. Alongside their new measure of scientific fundamentalism (conceptualised as implicit religion), Francis, Astley, and McKenna (2018) employed the Astley-Francis Scale of Attitude toward Theistic Faith (Astley, Francis, & Robbins, 2012) as a measure of explicit religion and two measures shown by previous research to be positively correlated with explicit religion: the ten-item Self-esteem Scale proposed by Rosenberg (1965) and shown to be connected with explicit religion by Penny and Francis (2014); and the 23-item empathy scale proposed by the Junior Eysenck Impulsiveness Questionnaire (Eysenck, Easting, & Pearson, 1984) and shown to be connected with explicit religion by Francis, Croft, and Pyke (2012). Drawing on data from 11,809 13- to 15-year-old students, this study demonstrated a significant positive association between explicit religion and both self-esteem and empathy, and between implicit religion and both self-esteem and empathy.

The finding that what we style as 'faith in science' functions in a similar way as certain religious beliefs in respect of positive psychological functioning mirrors the work of Aghababaei (2016) where he speaks of 'scientific faith and positive psychological

functioning'. Aghababaei explored the connections between scores on the ten-item Belief in Science Scale proposed by Farias et al. (2013) and a range of measures within positive psychology concerned with satisfaction in life, subjective happiness, self-esteem, and hope, among a sample of 373 Iranian Muslim students. On the basis of these data, Aghababaei concluded that:

> this research, depicting the independent contributions of religious and scientific beliefs to positive psychological functioning, suggested that believing either in God or science is helpful for living a good, fully functioning life. (Aghababaei, 2016, p. 734)

This conclusion was supported by two further studies conducted among 474 Iranian university students by Aghababaei et al. (2016) and among 218 Iranian university students and 122 Iranian seminary students by Aghababaei (2018).

The finding that what we style as 'faith in science' functions in a similar way as certain religious beliefs in respect of positive psychological function also mirrors the recent work of Park, Burke, and David (2024) in their study of the contributions of religious and science beliefs as meaning systems in a nationally representative American sample.

While the psychology of religion has been able to advance plausible reasons for the connection between explicit religion and both self-esteem and empathy, on face value it may be more difficult to theorise why faith in science should be associated with better self-esteem and greater empathy. It is here that Edward Bailey's theory of implicit religion has real explanatory power. When faith in science, understood as an exaggerated, uncritical, and unqualified (and therefore distorted) appreciation of and trust in science and its unlimited applicability, is conceptualised as implicit religion, faith in science becomes associated with Bailey's three defining characteristics of implicit religion. According to Bailey, implicit religion displays *commitment*. In this sense, those who hold faith in science (in this way) are committed to that faith. Commitment generates a sense of identity (enhancing self-esteem)

and reduces threats from others (enhancing openness to others and thus nurturing empathy). According to Bailey, implicit religion provides *integrating foci*. In this sense, those who hold faith in science (in this way) hold to an integrating narrative that makes sense of the world, establishes the individual's place in the world, and explains the existential questions of life. An integrating narrative enhances the sense of competency and capacity (enhancing self-esteem) and offers a secure basis of knowing alongside which others can be placed (enhancing security alongside others and thus nurturing empathy). According to Bailey, implicit religion displays *intensive concerns with extensive effects*. In this sense, those who hold faith in science (in this way) hold an intensive belief with an extensive reach. Having faith that science can solve all the problems of the universe indeed carries with it extensive effects. Such wide-ranging confidence in science, like confidence in theistic faith, brings a sense of meaning and purpose in life (enhancing self-esteem), a sense of a brighter future for all people, and a sense of empowerment that mitigates fear of others (enhancing empathy). It is in ways like this that the construct of implicit religion offers fresh and refreshing insights into contemporary society and into the contemporary utility of the scientific investigation of enduring wisdoms embedded within explicit religious traditions.

Drawing on theories from theology

Having established the legitimacy of regarding faith in science (conceptualised as scientific fundamentalism) as meeting the criteria of functioning as an implicit religion (see Francis, Astley, & McKenna, 2018), the intention of the present paper is to explore the extent to which theories in theology (or religious studies) may help to explicate the connection between faith in science (as scientific fundamentalism) and antipathy for religions. This intention draws on and tests Bailey's notion that theories and methods developed within religious studies and within theology may be employed to interrogate, to interpret, and to understand the ways in which phenomena properly identified as implicit religion function

within contemporary society. The specific theory from theology on which the present study draws is that of the theology of religions.

The 'theology of religions' is the name that is often given by theologians to the interpretation and evaluation of the divergent truth-claims and views of salvation that are asserted or implied by different religious traditions. Within the discipline of the philosophy of religion, such topics are routinely referred to as issues, problems, or questions of religious diversity, sometimes under the heading of 'competing religious claims'.

A variety of standpoints on this subject may be found in the literature, with three main approaches being regularly distinguished (Knitter, 1985; Hick, 1985, 1995, 1989/2004, 1997; D'Costa, 1986, 1990; Byrne, 1995; Okholm & Phillips, 1996; Griffiths, 2001; Basinger, 2002).

1. *Exclusivism* is the traditional view that only one religious belief-system is true. Theological exclusivism (or 'particularism') holds that religious truth is 'primarily restricted to a particular religion' (Netland, 2007, p. 229).
2. *Inclusivism* is the view that one religion includes the key truths that are found within the other religious belief-systems; it therefore holds that this one system is pre-eminent and normative, but acknowledges that other faiths contain some truths. This has also been designated the *fulfilment* model (by Peter Phan, cited in Durka, 2012, p. 18).
3. *Pluralism*, unlike positions (1) and (2), privileges no one religious tradition, maintaining rather that all – or most – religious claims are on a par with respect to truth, especially when the religions speak of different, but non-conflicting, human conceptions of some ultimately ineffable reality (e.g. Hick, 1995, chs 1, 3; 1997, pp. 612-613). Its exponents often argue that it is the same truth that is being manifested

and recounted in different ways in these different religious traditions. This has also been called the *multireligious* model (Ziebertz, 2012, p. 167).

It is when faith in science mimics exclusivism as reflected within the theologies of religion that conflict may most readily emerge between science and religion. In this paper we refer to the exaggerated, uncritical, and unqualified belief in the inerrancy of science as 'scientific fundamentalism', drawing a parallel with the 'central tenet' of Christian religious fundamentalism that the Bible is inerrant, incapable of being wrong (Collins, 1983; cf. Barr, 1981, pp. 1, 36-37, 40, 51-55, 97-98; 1984, ch. 13). Drawing on an earlier established research tradition that has spoken both of scientism and of an exaggerated belief in science (see Fulljames, Gibson, & Francis, 1991; Francis & Greer, 2001; Astley & Francis, 2010), Francis, Astley, and McKenna (2018, 2019) proposed their narrower three-item measure of scientific fundamentalism as identifying one dimension of these wider concepts. This scientific fundamentalism measure comprises the following items:

- Theories in science can be proved to be definitely true
- The laws of science will never be changed
- Science can give us absolute truths

This short instrument now needs wider testing alongside the more recent delineation between scientism and science enthusiasm advanced by Lukić and Žeželj (2023).

Research agenda

Against this background, the present study was designed to test the thesis that an aspect of the perceived conflict between science and religion can be illuminated by conceptualising a particular kind of faith in science (styled here as 'scientific fundamentalism') as a form of implicit religion, and by considering the clash between this kind of faith in science and explicit religions through the lens offered by the 'theology of religions' that highlights the conflict between religions occurring when an exclusivist position is adopted. In order to test

this thesis, the present study: proposes a refined short measure of scientific fundamentalism; develops a new measure of antipathy to religions; draws on the Eysenckian three dimensional model of personality as providing key control variables alongside sex and age; and employs multiple regression modelling to examine the effect of scientific fundamentalism on antipathy to religions, after controlling for the effect of personal factors (sex and age), psychological factors (extraversion, neuroticism, and psychoticism), and religious factors (Christian affiliation, worship attendance, and personal prayer).

Method

Procedure

As part of a project on religious diversity designed to examine the experiences and attitudes of young people concerning religion within multi-cultural or multi-faith contexts throughout the four nations of the UK, classes of 13- to 14-year-old students and classes of 14- to 15-year-old students were invited to complete a detailed questionnaire survey. The participants were guaranteed confidentiality and anonymity, and were given the choice not to participate in the research project. Approximately half of the participating students were attending schools with a religious character within the state-maintained sector, and the other half were attending schools without a religious character within the state-maintained sector. Completed data were submitted by 11,809 participants: 5,519 male students, 6,216 female students, and 74 students who did not disclose their sex; 6,042 students aged 13 to 14 years, 5,720 students aged 14 to 15 years, and 47 students who did not disclose their age. Ethical approval was obtained from the University of Warwick Research Ethics Committee (reference 34/08-09).

Instrument

The *Religious Diversity and Young People's Values* questionnaire was designed for self-completion, using mainly a multiple-choice response format and short statements rated on a

five-point Likert scale: agree strongly (5), agree (4), not certain (3), disagree (2), and disagree strongly (1). In the present analysis the following variables were used.

Age and sex were assessed by dichotomous items: male (1) and female (2); two year groups of 13 to 14 years (1), and 14 to 15 years (2).

Personality was assessed by the abbreviated form of the Junior Eysenck Personality Questionnaire Revised (JEPQR-A: Francis, 1996). This instrument proposes three six-item measures of extraversion, neuroticism, and psychoticism. Each item is rated on a dichotomous scale: yes (1) and no (0).

Worship attendance was assessed by the question, 'Apart from special occasions (like weddings), how often do you attend a religious worship service (e.g. in a church, mosque, or synagogue)?', rated on a seven-point scale: never (1), at least once a year (2), sometimes (3), at least six times a year (4), at least once a month (5), nearly every week (6), and several times a week (7).

Personal prayer was assessed by the question, 'How often do you pray in your home or by yourself?', rated on a five-point scale: never (1), occasionally (2), at least once a month (3), at least once a week (4), and nearly every day (5).

Scientific fundamentalism was assessed by the three-item scale detailed above, developed from the seven-item measure proposed by Astley and Francis (2010). An example item is: 'Science can give us absolute truth'. Each item is rated on the five-point Likert scale of agree strongly through to disagree strongly.

Antipathy to religions was assessed by a new eight-item scale designed for the present study, The Francis-Astley Antipathy to Religions Index (FAAtRI). An example item is: 'Religion is mainly a force for bad in the world today.' Each item is rated on the five-point Likert scale of agree strongly through to disagree strongly.

Religious affiliation was assessed by a check list of categories comprising: no religion, Buddhist, Hindu, Jewish, Muslim, Sikh, Christian, and other (please specify).

Participants

The present analyses were conducted on the subset of the 11,809 participants who had identified themselves as either religiously unaffiliated or as affiliated with the Christian tradition (N = 10,792). This subset comprised 5,035 male students, 5,699 female students, and 58 students who did not disclose their sex; 5,500 students aged 13 to 14 years, 5,259 students aged 14 to 15 years, and 33 students who did not disclose their age.

Analysis

These data were analysed using the SPSS statistical package, drawing on the frequency, correlation, reliability, and regression routines. The regression routine employed fixed order entry so that the four sets of variables (personal factors, psychological factors, religious factors, and scientific fundamentalism) were structured *incrementally* in such a way that the personal variables were entered in step one, the psychological variables in step two, the religious variables in step three, and finally scientific fundamentalism in step four. This sequence allows the *additional* effects of the fundamentalism variable to be noted after the effects of all the other variables have been taken into account.

Results and discussion

The three variables concerned with explicit religious affiliation and practices demonstrated that 64% of the participants identified themselves as Christian and 36% as having no religious affiliation. In terms of frequency of worship attendance, 21% attended weekly, 6% at least once a month, 5% at least six times a year, 17% less than six times but more than once a year, and 10% once a year; 42% never attended worship services. In terms of frequency of personal prayer, 13% prayed daily, 7% at least once a week, 3% at least once a month, and 22% did so occasionally; 55% never prayed. This relatively high level of

religious practice reflects the fact that approximately half of the participating students were attending schools with a religious character within the state-maintained sector.

- insert table 1 about here -

The first step in data analysis examined the scale properties of the dependent variable (antipathy to religions), the measure of scientific fundamentalism, and the three psychological measures employed in the analytic model. Table 1 presents these data in terms of the alpha coefficient (Cronbach, 1951), their means and the standard deviations. Four of the five measures recorded alpha coefficients in excess of the threshold of .65 proposed by DeVellis (2003). The lower reliability reported by the psychoticism scale is consistent with the findings of earlier studies and with the recognised problematic nature of operationalising this dimension of personality (see Francis, Brown, & Philipchalk, 1992).

- insert table 2 about here -

Given the particular importance of establishing the properties of the newly constructed Francis-Astley Antipathy to Religions Index (α = .74), table 2 presents the eight items of this instrument, together with the correlations between the individual items and the sum of the other seven items, and the item endorsement in terms of the sum of the agree and the agree strongly responses. The levels of the correlations demonstrate that each item is covarying well in relation to the sum of the other seven items. The item endorsements demonstrate that nearly half of the participants regard religion as bringing more conflict than peace (46%), that nearly a third see religious people as often intolerant of others (31%), and that one in five maintain that religion is mainly a force for bad in the world today (21%). Over a third of the participants feel that a lot of harm is done in the world by Muslims (36%), while 14% feel that a lot of harm is done in the world by Jews. One in ten of the participants would not like to live next door to Hindus (11%), to Sikhs (11%), or to Buddhists (10%).

- insert table 3 about here -

Table 3 takes a similar close look at the properties of the measure of scientific fundamentalism (α = .69). Once again the levels of the correlations between the individual items and the sum of the other two items demonstrate that each item is covarying well with the other items in the scale. The scale of scientific fundamentalism records that 42% believe that theories in science can be proved to be definitely true, that 27% believe that science can give us absolute truths, and that 25% believe that the laws of science will never be changed.

- insert table 4 about here -

The third step in data analysis examined the bivariate correlations between scores recorded on the FAAtRI and each of the two personal factors (sex and age), the three psychological factors (extraversion, neuroticism, and psychoticism), the three religious factors (Christian affiliation, worship attendance, and personal prayer), and the measure of scientific fundamentalism. These correlation coefficients are presented in the first column of table 4. The data show that, considered independently, one of the two personal factors is significantly correlated with scores on the index of antipathy to religions. Male students score significantly higher than female students on this index, while age is uncorrelated with scores on the index. Two of the personality factors are significantly correlated with scores on the index of antipathy of religions. Higher scores on the index are correlated with higher neuroticism scores and with higher psychoticism scores. All three of the religious factors are significantly correlated with scores on the index of antipathy to religions. Lower scores on the index are correlated with Christian affiliation, with worship attendance, and with personal prayer. The scientific fundamentalism factor is significantly correlated with scores on the index of antipathy to religions. Higher scores on this index are correlated with higher scientific fundamentalism.

- insert table 5 about here -

Discussion of the bivariate correlations between the index of antipathy to religions and the personal, psychological, religious and fundamentalism factors overlooks the complex interrelationships among these predictor variables. The fourth step in data analysis makes these correlations explicit. The data presented in table 5 show that sex is significantly correlated with all the psychological, religious and scientific fundamentalism variables. Female students records significantly higher on extraversion and neuroticism (two of the psychological factors), and on religious affiliation, worship attendance and personal prayer (all three of the religious factors). Male students record significantly higher on psychoticism and on scientific fundamentalism. Age, however, is less significant in terms of the correlations with other factors in the model.

Among the psychological factors, psychoticism is significantly correlated with all three religious factors. Lower psychoticism scores are associated with higher levels of religious affiliation, higher levels of personal prayer, and higher levels of worship attendance. Neuroticism scores are also significantly correlated with all three religious factors. Higher neuroticism scores are associated with higher levels of religious affiliation, higher levels of personal prayer, and higher levels of worship attendance. Extraversion scores are less clearly associated with the religious factors.

There are high correlations among the three religious factors (affiliation, worship attendance and personal prayer) and between the religious factors and scientific fundamentalism. Scientific fundamentalism is lower among the students who are religiously affiliated, who attend worship services, and who engage in personal prayer.

In light of the complex bivariate correlations among the predictor variables, the fourth step in data analysis employs a series of regression models in which the four groups of predictor variables are entered into the model as displayed in table 4. Model 1 takes into account the two personal factors (sex and age). Model 2 add the psychological factors

(extraversion, neuroticism, and psychoticism). Model 3 adds the religious factors (Christian affiliation, worship attendance, and personal prayer). Model 4 adds the scientific fundamentalism factor. Each of these three steps adds significantly to the proportion of variance explained within the dependent variable (antipathy to religions). It is the final model (when all the predictor variables are within the equation) that is most revealing. In this model, sex remains a significant predictor. Male students record significantly higher scores than female students on the index of antipathy to religions. In this model all three psychological factors are statistically significant predictors. Higher levels of antipathy to religions are associated with higher psychoticism scores, higher neuroticism scores, and higher extraversion scores. In this model, personal religiosity as expressed through personal prayer offers significant predictive power and so does Christian affiliation, but in opposite directions. These data suggest that religiously engaged students (those who pray) record lower scores on the index of antipathy to religions, while the index of religious affiliation (nominal religiosity) is associated with higher scores on the index of antipathy to religions. In this model, scientific fundamentalism adds significant statistical power. Students who record higher scores on scientific fundamentalism also record higher scores on the index of antipathy to religions. While the above discussion of the beta weights confirms the statistical significance of these factors, the effect sizes remain small, as is generally the case in the studies of this nature.

Conclusion

The present study was designed to test the thesis that an aspect of the perceived conflict between science and religion can be illuminated by drawing on Edward Bailey's notion of implicit religion to conceptualise a particular kind of faith in science (styled here as 'scientific fundamentalism') as a form of implicit religion, and by considering the clash between this kind of faith in science and explicit religions through the lens offered by the

'theology of religions' that highlights the conflict between religions occurring when an exclusivist position is adopted. This thesis was tested on data provided by 10,792 students between the ages of 13 and 15 years who identified themselves as either religiously unaffiliated or as affiliated with the Christian tradition.

In order to test this thesis, the research agenda proposed four key steps. The first key step proposed refining a short measure of scientific fundamentalism, developed from the seven-item measure of scientism proposed by Astley and Francis (2010) that would map more coherently onto the established notion of religious fundamentalism. The three items identified to capture this construct of religious fundamentalism drew together the following ideas: that theories in science can be proved to be definitely true; that the laws of science will never change; and that science can give us absolute truths. The data demonstrated that this instrument achieved a satisfactory level of internal consistency reliability for such a short scale, and that each of the three items contributed appropriately to this scale. The first conclusion is that this short measure of scientific fundamentalism can be commended for further application.

The second key step proposed developing a new measure of antipathy to religions, drawing on the range of items available within the Young People's Attitudes to Religious Diversity Project. From a range of available items, eight items were identified that drew together three main indicators of antipathy to religions. The first indicator focused on social proximity theory and expressed dislike for living next door to members of three religious groups (Buddhists, Hindus, and Sikhs). The second indicator focused on prejudicial views of adherents to religions and asserted that a lot of harm is done in the world by members of two religious groups (Jews and Muslims). The third indicator focused on hostile attitudes toward religion, suggesting: that religion brings more conflict than peace; that religious people are often intolerant of others; and that religion is mainly a force for bad in the world today. The

data demonstrated that this instrument achieved a satisfactory level of internal consistency reliability, and that each of the eight items contributed appropriately to this scale. The second conclusion is that this eight-item Francis-Astley Antipathy to Religions Index (FAAtRI) can be commended for further application.

The third key step proposed contextualising the analysis of the association between scientific fundamentalism and antipathy to religion within personal and psychological factors. The personal factors proposed were sex and age. The psychological factors proposed were the three components of the Eysenckian dimensional model of personality: extraversion, neuroticism, and psychoticism. The data confirmed the wisdom of this approach, confirming the ways in which these personal and psychological factors related to religion (both explicit and implicit) and to antipathy to religions. The third conclusion is that future research working in this field would be wise to continue to employ this set of control variables.

The fourth key step proposed employing multiple regression modelling to examine the effect of scientific fundamentalism on antipathy to religions, after controlling for personal factors (sex and age), psychological factors (extraversion, neuroticism, and psychoticism), and religious factors (Christian affiliation, worship attendance, and personal prayer). After taking these control variables into account, the data confirmed the significant association between scores recorded on the measure of scientific fundamentalism and scores recorded on the measure of antipathy to religions. Two conclusions can be drawn from this finding, regarding the utility of Edward Bailey's theory of implicit religion for illuminating the perceived conflict between science and religion. The first of these two conclusions concerns the category of implicit religion itself and the value of conceptualising some expressions of faith in science as fulfilling similar functions to those fulfilled by explicit religions. The second of these two conclusions concerns the way in which theories developed within theology and religious studies may be applied to analysing and understanding implicit

manifestations of religion as well as explicit manifestations of religion. The case in point in the present study concerns insights derived from the theology of religions. The present study has demonstrated that when a particular kind of faith in science mimics the exclusivist position within the theology of religions, conflict emerges between science and religion. This finding may help to set the agenda for future research and to set the agenda for educational practice.

In terms of future research, the present study has operationalised assessment of faith in science in respect of only one of the options proposed by the theology of religions (exclusivism). Future research needs now to operationalise measures that reflect the positions of inclusivism and pluralism. This endeavour could illuminate formulations of faith in science that provide more constructure dialogue between science and religion.

In terms of educational practice, the present study has highlighted beliefs about science that may foster antipathy, antagonism, and opposition toward religions and toward religious adherents. Conceptualising faith in science as implicit religion and identifying the detrimental impact of some expressions of faith in science, in terms of social inclusion and social cohesion within religiously plural societies, may turn attention from the religious education classroom toward the science classroom for the focus on identifying fundamentalist beliefs that may be socially disruptive. After all, a science classroom that pays proper attention to the philosophy of science may not readily endorse the three markers taken to comprise the index of scientific fundamentalism employed in the present study: theories in science can be proved to be definitely true; the laws in science will never be changed; and science can give us absolute truths.

The main limitation with the present study is that it relied on the secondary analysis of data collected primarily as part of the Young People's Attitudes to Religious Diversity Project. Since this project was designed primarily to capture diverse perspectives on young

people's perceptions of the six main religious traditions visible across the United Kingdom and identified by the 2001 religious question in the census (Buddhism, Christianity, Hinduism, Islam, Judaism, Sikhism, and No religion), questions on science were introduced at a secondary analytical level and consequently were restricted in range. This limitation could be addressed by a parallel project designed specifically to access the role of faith in science in shaping social inclusion and social cohesion within religiously plural societies.

Note

Young People's Attitudes to Religious Diversity Project (AHRC Reference: AH/G014035/1) was a large-scale mixed methods research project investigating the attitudes of 13- to 16-year-old students across the United Kingdom. Students from a variety of socio-economic, cultural, ethnic, and religious backgrounds from different parts of England, Wales, Northern Ireland and Scotland, with the addition of London as a special case, took part in the study. Professor Robert Jackson was principal investigator and Professor Leslie J. Francis was co-investigator. Together they led a team of qualitative and quantitative researchers based in the Warwick Religions and Education Research Unit, within the Centre for Education Studies at the University of Warwick. The project was part of the AHRC/ESRC Religion and Society Programme and ran from 2009-2012.

Disclosure statement

The authors report there are no competing interests to declare.

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Data availability

Data are available from the corresponding author upon reasonable request.

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Table 1

Scale properties

Scale	N items	alpha	Mean	SD	Low	High
Antipathy to religions	8	.74	20.53	5.65	8	40
Scientific fundamentalism	3	.69	9.30	2.58	3	15
Extraversion	6	.69	4.71	1.53	0	6
Neuroticism	6	.68	3.10	1.80	0	6
Psychoticism	6	.59	1.15	1.28	0	6

Table 2

Francis-Astley Antipathy to Religions Index (FAAtRI): Scale properties

	r	Yes %
Religion brings more conflict than peace	.31	46
Religious people are often intolerant of others	.32	31
Religion is mainly a force for bad in the world today	.33	21
A lot of harm is done in the world by Jews	.37	14
A lot of harm is done in the world by Muslims	.43	36
I would not like to live next door to Hindus	.59	11
I would not like to live next door to Sikhs	.59	11
I would not like to live next door to Buddhists	.56	10

Note: r = correlation between the item and the sum of the other items in the scale

Yes % = sum of the agree and agree strongly responses

Table 3

Scientific fundamentalism: Scale properties

	r	Yes %
Theories in science can be proved to be definitely true	.53	42
The laws of science will never be changed	.44	25
Science can give us absolute truths	.56	27

Note: r = correlation between the item and the sum of the other items in the scale

Yes % = sum of the agree and agree strongly responses

Table 4

Regression models: Antipathy to religions

	R	Model 1	Model 2	Model 3	Model 4
Personal factors					
Sex	-.13***	-.13***	-.10***	-.10***	-.01***
Age	.01	.01	.01	.01	.00
Psychological factors					
Extraversion	02		.03**	.03**	.02*
Neuroticism	.04***		.07***	.08***	.06***
Psychoticism	.21***		.18***	.18***	.18***
Religious factors					
Christian affiliation	-.02*			.04***	.04***
Worship attendance	-.07***			-.02	-.01
Personal prayer	-.09***			-.07***	-.05***
Fundamentalism					
Scientific	.18***				.17***
Total R^2		.02	.06	.06	.09
Δ		.02***	.04***	.01***	.03***

Note: * $p < .05$; ** $p < .01$; *** $p < .001$

Table 5

Correlations between personal, psychological, religious and fundamentalism factors

	Sex	Age	SF	Pr	Wo	Af	P	N
Extraversion (E)	.09***	.04***	-.01	-.01	-.02	.03**	.05***	-.13***
Neuroticism (N)	.25***	.01	.02	.06***	.05***	.03**	.01	
Psychoticism (P)	-.27***	-.00	-.01	-.13***	-.14***	-.10***		
Affiliation (Af)	.06***	.02	-.07***	.45***	.54***			
Worship (Wo)	.07***	.00	-.11**	.63***				
Prayer (Pr)	.08***	.01	-.15***					
Scientific (SF)	-.10***	.02*						
Age (ag)	.02*							