

Awe and Scientific Explanation

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Abstract

Past research has established a relationship between awe and explanatory frameworks, such as religion. We extend this work, showing 1) the effects of awe on a separate source of explanation: attitudes towards science, and 2) how the effects of awe on attitudes towards scientific explanations depend on individual differences in theism. Across three studies, we find consistent support that awe decreases the perceived explanatory power of science for the theistic (Study 1 and 2), and mixed support that awe affects attitudes towards scientific explanations for the non-theistic (Study 3).

Word Count: 89

Keywords: Awe, religion, science, explanation

Religious experience has been associated with awe and wonder (James 1902/1987) and empirical work has shown that manipulations of awe can increase reported religiosity (Valdesolo & Graham, 2014) and spirituality (Van Cappellen & Saroglou, 2012). Awe involves an “immediate failure to assimilate information into existing mental structures” (Keltner & Haidt, 2003; Shiota, Keltner, & Mossman, 2007) and accompanying states of uncertainty trigger motivations for explanation and meaning-making. Religious and supernatural frameworks are one means of satisfying these motives, allowing individuals to explain environmental occurrences via the causal power of supernatural agents (Atran, 2002; Inzlicht, Tullet, & Good, 2011a, 2011b; Kay, Whitson, Gaucher, & Galinsky, 2009).

But science can also serve as a strong source of meaning and explanation (e.g., Dawkins, 1998; Sagan, 2006). Indeed, affinity for secular and supernatural explanations for the world share motivational similarities (Preston, 2011), and if awe increases the general motivation to find order and explanation, then the means through which that is achieved (e.g., belief in supernatural agents or affirming a scientific worldview) could be secondary (cf. Rutjens, van der Pligt, & van Harreveld, 2010). The present studies build from these theories to test whether awe might influence attitudes towards scientific explanations.

Some work suggests that religious and scientific explanations are in opposition, such that belief in one automatically decreases affinity for the other (Preston & Epley, 2009). On this account, if awe increases belief in supernatural forces (Valdesolo & Graham, 2014), it might correspondingly decrease affinity for science. But the relationship between awe and these ultimate explanations might be more complicated. Studies have shown the anxiety-reducing role of accepting scientific explanations, but exclusively among *secular* populations (Farias, Newheiser, Kahane, & de Toledo, 2013; Rutjens et al., 2010; Rutjens, van Harreveld, van der

Pligt, Kreemers, & Noordewier, 2013), suggesting that awe-induced attraction towards scientific vs. supernatural explanations might depend on existing levels of theism. Awe might preferentially drive theists towards supernatural sources of explanation and order, and non-theists preferentially towards scientific ones.

At the same time, research has shown that individuals can simultaneously endorse both natural and supernatural explanations (Evans 2001; Evans & Lane 2011; Legare, Evans, Rosengren & Harris, 2012), and that even non-theists demonstrate intuitive affinities for supernatural and purpose-driven explanations (Banerjee & Bloom 2014; Jarnefelt, Canfield & Kelemen 2015). This suggests that the kinds of explanations awe attracts individuals towards might not be straightforwardly predicted by theism. The motives for order and meaning elicited by awe might preferentially drive theists to supernatural explanations and away from scientific ones, but non-theists might be drawn towards either supernatural or scientific explanations.

The current studies draw upon this literature to explore the effect of awe on attitudes towards science as a function of individual differences in theism. Studies 1 and 2 tested the effects of theism and manipulated awe (compared with neutral and amusement conditions) on attitudes towards scientific explanations. Study 3 tested the effects of theism and manipulated awe (compared with neutral condition) on attitudes towards versions of scientific theories emphasizing randomness vs. order. This work would be the first to show a relationship between awe and attitudes towards scientific explanation, while also further elucidating the relationship between awe and theism.

Study 1

Study 1 tested the effect of awe and theism on a measure of *belief in science*.

A total of 158 college students (97 female, $M_{\text{age}} = 19.66$) participated in a computer-based study in return for course credit (sample size determined in advance, with a target of 50 participants per cell). Participants were randomly assigned to one of three conditions: awe, amusement, or neutral.

Procedure

Participants first answered seven questions, adapted from previous research, measuring religiosity (Shenhav, Rand & Greene, 2012) and supernatural beliefs (Kay et al., 2009), including the target question measuring general theism (6 point scale ranging from *confident atheist* to *confident believer*). Participants then watched either a neutral nature video, an awe-inducing nature video, or an amusing nature video (both previously shown to be effective in eliciting awe and amusement, respectively; see Valdesolo & Graham, 2014 for full details). All videos were in the content domain of nature to avoid potential confounds associated with merely priming nature concepts.

Participants then answered the 10-item “belief in science” scale measuring their epistemic beliefs regarding science “as a superior, even exclusive, guide to reality, and as possessing unique and central value” (cf. Farias et al., 2013). Responses were reported on six-point scales from 1, *strongly disagree*, to 6, *strongly agree* (example item: “We can only rationally believe in what is scientifically provable”). Finally, participants completed an eight-item emotion manipulation check measuring a variety of emotional states on 7-point scales from 1, *not at all*, to 7, *extremely* (See Supplemental Materials for full details of methodology across all studies)

Results and Discussion

31 participants were removed from analyses. A programming error for the first 28 participants resulted in incomplete data, and an additional three participants were removed due to patterns of responding indicating low attention, leaving us with a final sample of 127.

Manipulation checks confirmed that videos influenced the intended emotions across comparison conditions (see supplemental materials).¹ There were no differences across conditions in levels of theism ($M_{awe} = 3.38$, $SD_{awe} = 1.29$, $M_{amuse} = 3.51$, $SD_{amuse} = 1.35$, $M_{Neut} = 3.73$, $SD_{neut} = 1.3$; $F(2,124) = .763$), and theism correlated significantly with reported belief in science across all experimental conditions, $r(127) = -.46$, $p < .001$. Furthermore, theism did not moderate the effect of condition on reported awe ($p = .736$). These patterns held across all studies.

Responses on the scale of belief in science were averaged to form the *belief in science* index ($\alpha = .873$) and responses did not vary by experimental condition ($M_{awe} = 3.56$, $SD_{awe} = 1.13$; $M_{amuse} = 3.65$, $SD_{amuse} = .88$; $M_{Neut} = 3.65$, $SD_{neut} = .79$; $F = .126$). Of primary interest, we conducted a condition x theism multiple regression predicting participants' belief in science scores. Theism ratings were mean-centered as recommended by Aiken and West (1991) and entered in Step 1 along with emotion condition (neutral, amusement, and awe) contrast coded as -1, -1, and 2, respectively. In Step 2 we entered the interaction term condition x theism. There was no main effect of condition ($b = -.057$, $\beta = -.085$, $p = .29$), but there was a significant main effect of theism ($b = -.332$, $\beta = -.467$, $p < 0.001$). As predicted, we found a significant interaction ($b = -.116$, $\beta = -.224$, $p = .005$, 95% confidence interval [CI] = [-.196, -.037]) suggesting that theism moderates the effect of condition on attitudes towards science. Effect size attributable to the addition of the interaction: Cohen's $f^2 = .053$. Examining simple slopes at +/- 1 standard deviation (SD) from the mean revealed that theists showed lower belief in science in the

awe condition compared to amusement and control conditions, $b = -.221$, $\beta = -.329$, $p = .005$, 95% CI = [-.373, -.069], whereas emotion condition had no effect on non-theists. In sum, awe decreased belief in science for theists, but did not affect attitudes towards science for non-theists.

These data support the possibility of an automatic opposition between scientific and religious explanations for theists. However, data for non-theists fit with research showing the co-existence of scientific and supernatural explanations (Jarnefelt et al 2015). In short, non-theists might not show a preference for scientific explanations after awe since they also seem to be intuitively inclined towards supernatural and purpose driven explanations. However, the this null effect might be due to the dependent variable. The belief in science measure may best capture epistemic evaluations of scientific truth (e.g., “Science provides us with a better understanding of the universe than does religion”) as opposed to the ability of science to provide explanation and order. Past studies have shown how non-theists’ motives for understanding and meaning lead to unique effects on endorsement of scientific theories framed as orderly and predictable as opposed to random and unpredictable (Rutjens et al., 2010; Rutjens et al., 2013). Awe might influence non-theists’ valuations of science but only when it is explicitly perceived to provide explanatory order. To test this possibility, we replicated our study, replacing the measure of belief in science with a measure designed to more directly assess participants’ attitudes towards science as providing explanation and order to the world.

Study 2

Study 2 used an online sample from Amazon Mechanical Turk. 413 participants (221 female, $M_{\text{age}} = 35.6$; target sample size determined by 2.5x sample of Study 1, c.f. Simohnson 2015) participated for \$1.00, and were randomly assigned to one of three conditions: neutral, amusement, awe. The procedure was identical to Study 1 except we replaced the belief in science

scale with a measure of belief in *scientific order*. Participants indicated how likely the following statements were to be true on 1-6 scales ranging from *not at all likely* to *extremely likely*: “the events that unfold in this world can be entirely explained by science”, “the principles of science provide order and predictability to the world”, and “the course of evolution follows certain paths, and is not just the result of random processes.”²

Results and Discussion

49 participants were removed from analysis due to patterns indicating low attention leaving a final sample of 364. Manipulation checks confirmed that videos influenced the intended emotions across comparison condition. Responses on two of our measures of scientific order were averaged to form the *scientific order* index ($\alpha = .69$) and responses did not vary by experimental condition ($M_{awe} = 4.09$, $SD_{awe} = 1.36$; $M_{amuse} = 4.13$, $SD_{amuse} = 1.22$; $M_{Neut} = 4.22$, $SD_{neut} = 1.19$; $F = .344$).³ An emotion condition x theism multiple regression showed no main effect for condition ($b = -.017$, $\beta = -.019$, $p = .67$), a significant main effect of theism ($b = -.401$, $\beta = -.532$, $p < 0.001$), and replicating Study 1, a significant interaction ($b = -.055$, $\beta = -.104$, $p = .019$, 95% confidence interval [CI] = $[-.102, -.009]$). Effect size attributable to the addition of the interaction: Cohen’s $f^2 = .011$. Theists (defined at 1 SD above the mean in theism) showed lower belief in science in the awe condition compared to amusement and control conditions, $b = -.122$, $\beta = -.109$, $p = .05$, 95% CI = $[-.218, .00]$. Simple effect for non-theists (defined at 1 SD below the mean) were not statistically significant, though were in the direction of awe increasing affinity for scientific order, $b = .084$, $\beta = .075$, $p = .18$, 95% CI = $[-.035, .186]$.

Study 3

The results of Study 1 and 2 provide support for the effect of awe on theists’ attitudes toward science, but no support for non-theists’ attitudes. Study 3 was designed as a final test of

awe's effects on attitudes towards science across levels of theism, but measuring attitudes toward scientific theories explicitly framed as either orderly or random.

Evolutionary theory emphasizes the importance of randomness in the process of natural selection, and as a result can be perceived as existentially threatening (Brem, Ranney, & Schindel, 2003). Indeed, manipulating feelings of control changes non-theists' preferences for different variants of evolutionary theory (Rutjens et al., 2010), with preferences for versions emphasizing order (versus randomness) increasing after feelings of lost control. We tested whether awe, compared to a neutral state, would increase preference for orderly theories of evolution across theism.

Methods

Participants

161 participants (81 female, $M_{\text{age}} = 37.5$; 80 per cell sample size determined in advance) completed an online study conducted on Amazon Mechanical Turk in exchange for \$1.00. Participants were randomly assigned to one of two conditions: awe and neutral.

Procedure

The procedure replicated Study 1 with the exception that the "belief in science" scale was replaced by a measure of participants' preferences for orderly vs. random scientific theories. This task was adapted from Rutjens et al. (2010) and was framed as a reading comprehension test in which participants would be presented with two scientific theories about which they would later need to recall information. Participants in all conditions were presented with two descriptions of evolutionary theory, one of which emphasized the necessary role of randomness and unpredictability in the theory (Theory 1), the other of which emphasized the role of order and structure (Theory 2). Participants were asked to select the theory that "provides the best

framework to explain the origin of life on this planet” as well as to rate each theory on the degree to which it fit with their views on the origin of life (rated from 1 *not at all*, to 7, *extremely*).

Results and Discussion

24 participants were removed for failing comprehension checks, leaving a final sample of 137. Manipulation checks confirmed that videos influenced the intended emotions across comparison condition. A generalized linear model predicting theory choice (Theory 1 or Theory 2) from condition, theism and their interaction revealed no main effect for condition ($b = .472$, $OR = 1.603$, $p = .22$) but a significant main effect of theism ($b = .510$, $OR = 1.665$, $p < 0.001$), and a significant interaction $X^2(1,133) = 4.544$, $p = .03$. Awe increased preference for the orderly version of evolution for non-theists, but had no effect on theory preference for theists. Analysis of continuous attitudes towards theories were consistent with this effect. We examined simple slopes in each condition at 1 SD above and below the mean for the theism variable. Non-theists showed higher ratings of perceived fit for Theory 2 in the awe condition compared to the control condition, ($b = 1.083$, $\beta = .332$, $p = .004$) whereas emotion condition did not affect theists' rating (See Supplemental for full results).

Conclusion

This work shows a relationship between awe and attitudes towards science, and adds complexity to the study of how awe influences reliance on different explanatory frameworks. We found a consistent decrease in theists' attitudes towards science and scientific order after experiencing awe (Study 1 and 2), and mixed support for our predictions regarding the effect of awe on non-theists' scientific beliefs. While awe did not increase non-theists' valuation of science “as a superior, even exclusive, guide to reality” (Study 1) or ratings of *scientific order* (Study 2), we did find that awe influenced preferences for a version of evolutionary theory that

construes it as a predictable and orderly process (Study 3). These findings suggest that awe drives theists' away from scientific explanations (and correspondingly towards supernatural explanation; c.f. Valdesolo & Graham 2014), but only tentatively suggests that awe drives secular individuals towards science. Indeed, it seems that awe attracts non-theists to scientific explanations to the extent that science is framed as explicitly providing order and explanation and eschewing the importance of randomness in the process (disconcerting to those interested in promoting an accurate understanding of evolution).

There is much more work to be done on this topic, particularly given the mixed results we present here. It seems clear, however, that the effect of awe on explanation is not limited to the domain of the supernatural, and that existing differences in theism matter in determining what kinds of explanations experiences of awe motivate.

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Footnotes

1. Though other significant differences in reported emotions did emerge across conditions (consistent with previous use of these kinds of manipulations) in both this study as well as in Studies 2 and 3, none of these other states were consistently related to the experimental conditions across the studies. Furthermore, the strongest effects across all studies were consistently in reported awe.
2. This study also moved the measure of *supernatural control* (c.f. Valdesolo & Graham, 2014) from pre to post manipulation. We do not report results for these items, but the effect of emotion condition on supernatural control was significant, replicating this previous work ($p = .041$). We also included two items adapted from previous research (Laurin, Kay, Moskovitch 2008) meant to measure motives of compensatory control as a potential mediator of the effects of awe on attitudes towards scientific explanations. We found no effect of condition or theism on these items, and the role of this mechanism in mediating the effect of awe on explanation requires further research.
3. Responses to the item describing evolution as following certain paths were excluded from analysis due to poor reliability.

Supplemental Materials

Additional details from Methods and Results

Sample Size Determination:

Sample size for Study 1 was determined through planning data collection for the Fall semester of 2014 (50 participants per cell) and data were not analyzed prior to the completion of collection (this is in keeping with the norms of the lead author's lab, which needs to operate within the constraints of the participant pool at a small liberal arts college). Given that there had been no previous studies testing this hypothesis, we did not conduct a priori power analyses using existing estimates of effect size. We planned to match the sample of Study 3 to that of Study 1 in terms of approximate participants per cell, and allowing for 10-15% exclusion rates, which is generally what we find using our exclusion criteria on mTurk (these criteria are described below in response to Reviewer #1). For the new added study we have followed the recommendations of Simohnson (2015) for running well-powered replications of effects (i.e. 2.5 times the original study's sample). This led us to a target sample of 400 participants.

Study 1:

Methods

Participants were told that the topic of the study was “personality and decision making” and were asked to watch a video and complete several questionnaires. They first answered seven questions, adapted from previous research, measuring religiosity (Shenhav, Rand & Greene, 2012) and supernatural beliefs (Kay et al., 2009). They consisted of four items borrowed from Shenhav et al. (2012), including the target question measuring general theism (6 point scale ranging from *confident atheist* to *confident believer*), and a three-item index of *supernatural control* from Kay et al. (2009). After completing these measures, participants watched either a neutral nature video (a five minute documentary on goby fish, pre-tested to ensure absence of strong emotional responses), an awe-inducing nature video, or an amusing nature video (both previously shown to be effective in eliciting awe and amusement, respectively; see Valdesolo & Graham, 2014 for full details). All videos were in the content domain of nature to avoid potential confounds associated with merely priming nature concepts.

Participants then answered the 10-item “belief in science” scale measuring their epistemic beliefs regarding science “as a superior, even exclusive, guide to reality, and as possessing unique and central value” (cf. Farias et al., 2013). Responses were reported on six-point scales from 1, *strongly disagree*, to 6, *strongly agree* (example item: “We can only rationally believe in what is scientifically provable”). Participants then completed an eight-item emotion manipulation check measuring a variety of emotional states (awe, amusement, happiness, gratitude, fear, disgust, anger, sadness; example item: “To what extent did you experience *awe* while watching the video clip?”). Responses were made using 7-point scales from 1, *not at all*, to 7, *extremely*.

Results

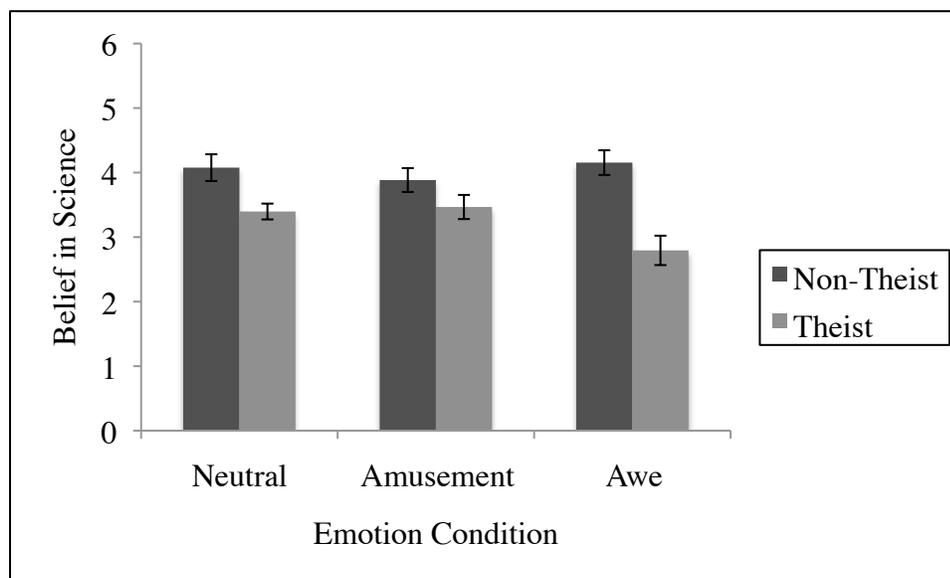
Participant exclusion criteria

Three participants were removed due to the following three observations on experimental log-sheets made by Research Assistants serving as experimenters and observing participants via lab cameras:

1. “participant skipped over video manipulation”
2. “participant was texting during experiment”
3. “participant was in another awe study and knew what it was about”

Manipulation check. Confirming the efficacy of the manipulation, planned contrasts revealed that participants experienced more awe in the awe condition ($M = 6.15$, $SD = 1.27$) than in the neutral ($M = 4.33$, $SD = 1.68$) and amusement conditions ($M = 3.3$, $SD = 1.74$), $F(1,124) = 33.64$, $p < .001$, and greater amusement in the amusement condition ($M = 5.98$, $SD = 1.1$) than in the awe ($M = 4.03$, $SD = 1.89$) and neutral conditions ($M = 4.36$, $SD = 1.56$), $F(1,124) = 19.478$, $p < .001$.

Graph of Results



Mean belief in science scores by emotion condition and theism in Study 1. Error bars represent one standard error. Theism scores transformed into a dichotomous variable of *non-theists* (values of 1, 2, and 3 on the 6 point theism scale, $n = 58$) and *theists* (values of 4, 5, and 6, $n = 69$).

Main analyses without planned contrasts. We ran an analogous model to that reported in the main text (DV = belief in science index), but this time without planned contrasts. We entered emotion condition into a linear regression model as a factor variable with awe condition as the reference group (i.e., intercept). An emotion condition x theism multiple regression showed no significant differences between awe and either amusement or control conditions ($p = .48$ and $p = .26$, respectively), a significant main effect of theism ($b = -.334$, $\beta = -.292$, $p < .001$), and also a

significantly greater effect of theism for those individuals in the awe condition compared to both the neutral ($b = .342, \beta = .481, p = .015$) and the amusement conditions ($b = .354, \beta = .309, p = .012$).

STUDY 2:

Results

Participant exclusion criteria

Participants were excluded for either 1) an inaccurate response to our attention check item, which was embedded randomly in our DV's ("To ensure you are paying attention, please select the 'strongly disagree' option") or 2) clicking through the video manipulation before it completed (i.e. participants were removed if they spent less time on the screen presenting the video than the length of each video). Six participants were removed for criterion 1 and 43 for criterion 2.

These have been the standard operating procedures for the lead author's lab on mTurk studies and typically lead to 10-15% exclusion rates, which is consistent with the norms of mTurk studies.

Scientific Order Scale

The item "evolution follows certain paths" did not correlate well with the other two items adapted to form this scale. Its inclusion dropped the reliability of this measure to an alpha of .357. Indeed, it correlated negatively with the item *the events that unfold in this world can be entirely explained by science* ($r = -.1, p = .056$).

Manipulation check. Planned contrasts revealed that participants experienced more awe in the awe condition ($M = 5.85, SD = 1.3$) than in the neutral ($M = 4.77, SD = 1.76$) and amusement conditions ($M = 3.44, SD = 1.72$), $F(1,361) = 68.151, p < .001$, and greater amusement in the amusement condition ($M = 5.9, SD = 1.41$) than in the awe ($M = 3.91, SD = 1.8$) and neutral conditions ($M = 5.25, SD = 1.54$), $F(1,361) = 49.495, p < .001$. There were no differences across conditions in levels of theism, ($M_{awe} = 4.11, SD_{awe} = 1.7, M_{amuse} = 4.04, SD_{amuse} = 1.65, M_{Neut} = 4.0, SD_{neut} = 1.67$; $F(2,361) = .135$), and theism correlated significantly with reported scientific order across all experimental conditions, $r(364) = -.533, p < .001$. Theism did not moderate the effect of condition on reported awe.

Supernatural control. We found a main effect of condition on supernatural control ($p = .041$) but this effect was not moderated by trait theism ($p = .443$). Awe significantly increased belief in supernatural control for theists ($p = .045$), but had no complementary effect on non-theists ($p = .363$). These data fit with the interpretation of a hydraulic relationship between scientific and supernatural explanation for theists (driving supernatural belief up and scientific belief down), but no such relationship for non-theists.

Main analyses without planned contrasts. We again reran the analysis reported in the main text (DV = scientific order) but this time without planned contrasts. We entered emotion condition into a linear regression model as a factor variable with awe condition as the reference group (i.e., intercept). An emotion condition x theism multiple regression showed no significant differences between awe and either amusement or control conditions ($p = .88$ and $p = .52$, respectively), a significant main effect of theism ($b = -.400, \beta = -.532, p < .001$), and also a significantly greater effect of theism for those in the awe condition compared to the neutral condition ($b = .203, \beta = .131, p = .014$) but not the amusement condition ($p = .11$).

STUDY 3:

Results

Participant Exclusion Criteria

Participants were excluded for either 1) an inaccurate response to our attention check item, which was embedded randomly in our DV's ("To ensure you are paying attention, please select the 'strongly disagree' option") or 2) clicking through the video manipulation before it completed (i.e. participants were removed if they spent less time on the screen presenting the video than the length of each video). Eighteen participants were removed for criterion 1 and 6 for criterion 2.

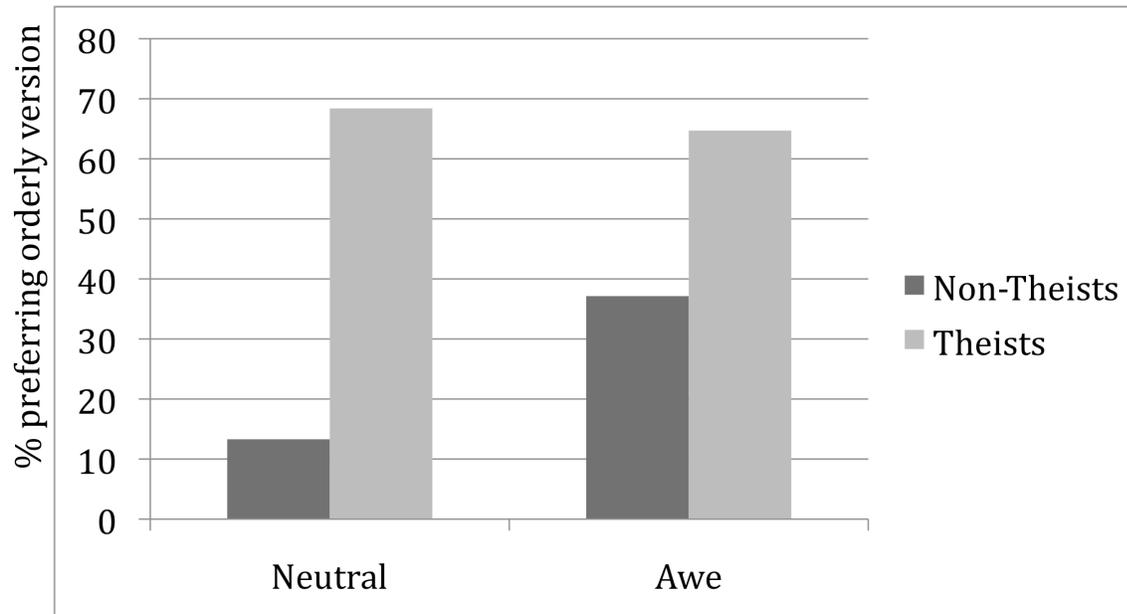
These have been the standard operating procedures for the lead author's lab on mTurk studies and typically lead to 10-15% exclusion rates, which is consistent with the norms of mTurk studies.

Manipulation check. Confirming the efficacy of the manipulation, participants experienced more awe in the awe condition ($M = 5.71, SD = 1.5$) than in the neutral mood condition ($M = 4.6, SD = 1.94$), $t(135) = 3.73, p < .001$. There were no pre-existing differences across conditions in levels of theism, ($M_{awe} = 3.54, SD_{awe} = 1.81, M_{Neut} = 3.79, SD_{neut} = 1.89$; $t(135) = .816, p = .416$) and levels of theism correlated negatively with endorsement of the random version of evolution $r(135) = -.503, p < .001$ and positively with endorsement of the ordered version, $r(135) = .244, p = .004$, across experimental conditions.

Continuous ratings of Theory 1 and 2. Since participants also indicated how much each theory fit with their views on the origin of life, we examined the interaction of condition and theism level on continuous ratings of Theory 1 and Theory 2. Using the same two step regression but with Theory 1 endorsement ratings as our outcome variable, we found no main effect of condition ($M_{awe} = 4.67, SD_{awe} = 1.8; M_{Neut} = 4.4, SD_{neut} = 1.81; t = .872$), a significant main effect of theism with theists showing significantly greater endorsement of Theory 1 than non-theists ($b = -.489, \beta = -.500, p < .001$), but no interaction between condition and theism ($p = .836$). Using the same for Theory 2 agreement ratings, we found no significant main effect of condition ($M_{awe} = 3.93, SD_{awe} = 1.67; M_{Neut} = 3.78, SD_{neut} = 1.61; t = .528$), a significant main effect of theism ($b = .220, \beta = .248, p = .004$) and a significant interaction of condition and theism ($b = -.488, \beta = -.383, p = .001, 95\% \text{ confidence interval [CI]} = [-.771, -.205]$) suggesting that Theism moderates the effect of Emotion Condition on perceived fit scores of Theory 2. Effect size attributable to the addition of the interaction: Cohen's $f^2 = .081$.

We examined simple slopes in each condition at 1 SD above and below the mean for the theism variable. Non-theists showed higher ratings of perceived fit for Theory 2 in the awe condition compared to the control condition, ($b = 1.083$, $\beta = .332$, $p = .004$) whereas emotion condition did not affect theists' ratings.

Graph of Results



Percentage of participants favoring the orderly version of evolutionary theory over the random version in Study 3. Theism scores transformed into a dichotomous variable of *non-theists* (values of 1, 2, and 3 on the 6 point theism scale, $n = 65$) and *theists* (values of 4, 5, and 6, $n = 72$).

ALL SCALE ITEMS

Supernatural Beliefs (Kay et al., 2009; measured in all studies)

How likely is it that the following statements are true?

God, or some type of non-human entity, is in control, at least in part, of the events within our universe.

1: Tremendously Doubtful – 2: Doubtful – 3: Slightly Doubtful – 4: Slightly Likely – 5: Likely – 6: Extremely Likely

The events that occur in this world unfold according to God's or some other nonhuman entity's plan.

1: Tremendously Doubtful – 2: Doubtful – 3: Slightly Doubtful – 4: Slightly Likely – 5: Likely – 6: Extremely Likely

There exists a spiritual order to the universe, such as Karma.

1: Tremendously Doubtful – 2: Doubtful – 3: Slightly Doubtful – 4: Slightly Likely – 5: Likely – 6: Extremely Likely

Religiosity (Shenhav et al., 2012; measured in all studies)

I consider myself to be a:

1: Confident Atheist – 2: Atheist – 3: Slight Atheist – 4: Slight Believer – 5: Believer – 6: Confident Believer

How have your religious beliefs changed since your childhood?

1: Much more of a confident atheist ---- 4: No change at all ---- 7: Much more of a confident believer

To what extent do you agree with the following statement? I consider myself to be strongly spiritual.

1: Tremendously Doubtful – 2: Doubtful – 3: Slightly Doubtful – 4: Slightly Likely – 5: Likely – 6: Extremely Likely

Please click the response that is most true to you: I have had an experience that has convinced me that God exists.

Yes - No

Belief in Science (Farias et al., 2013; measured in Study 1)

To what extent do you agree with the following statements?

Science is the most valuable part of human culture.

1: Strongly Disagree – 2: Moderately Disagree – 3: Slightly Disagree – 4: Slightly Agree – 5: Moderately Agree – 6: Strongly Agree

All the tasks human beings face are soluble by science.

1: Strongly Disagree – 2: Moderately Disagree – 3: Slightly Disagree – 4: Slightly Agree – 5: Moderately Agree – 6: Strongly Agree

Science provides us with a better understanding of the universe than does religion.

1: Strongly Disagree – 2: Moderately Disagree – 3: Slightly Disagree – 4: Slightly Agree – 5: Moderately Agree – 6: Strongly Agree

Science is the most efficient means of attaining truth.

1: Strongly Disagree – 2: Moderately Disagree – 3: Slightly Disagree – 4: Slightly Agree – 5: Moderately Agree – 6: Strongly Agree

Scientists and science should be given more respect in modern society.

1: Strongly Disagree – 2: Moderately Disagree – 3: Slightly Disagree – 4: Slightly Agree – 5: Moderately Agree – 6: Strongly Agree

The scientific method is the only reliable path to knowledge.

1: Strongly Disagree – 2: Moderately Disagree – 3: Slightly Disagree – 4: Slightly Agree – 5: Moderately Agree – 6: Strongly Agree

We can only rationally believe in what is scientifically provable.

1: Strongly Disagree – 2: Moderately Disagree – 3: Slightly Disagree – 4: Slightly Agree – 5: Moderately Agree – 6: Strongly Agree

Science tells us everything there is to know about what reality consists of.

1: Strongly Disagree – 2: Moderately Disagree – 3: Slightly Disagree – 4: Slightly Agree – 5: Moderately Agree – 6: Strongly Agree

“In a demon-haunted world, science is a candle in the dark.” (Carl Sagan)

1: Strongly Disagree – 2: Moderately Disagree – 3: Slightly Disagree – 4: Slightly Agree – 5: Moderately Agree – 6: Strongly Agree

The only real kind of knowledge we can have is scientific knowledge.

1: Strongly Disagree – 2: Moderately Disagree – 3: Slightly Disagree – 4: Slightly Agree – 5: Moderately Agree – 6: Strongly Agree

Compensatory Control (Adapted from Laurin, Kay, & Moskovitch, 2008; Measured in Study 2)

To what extent do you agree with the following statements?

My life is determined exclusively by my own actions.

1: Strongly Disagree – 2: Moderately Disagree – 3: Slightly Disagree – 4: Slightly Agree – 5: Moderately Agree – 6: Strongly Agree

I feel that I am in control of what happens in my life.

1: Strongly Disagree – 2: Moderately Disagree – 3: Slightly Disagree – 4: Slightly Agree – 5: Moderately Agree – 6: Strongly Agree

Belief in Scientific Order (Adapted from Kay et al., 2009; Measured in Study 2)

How likely is it that the following statements are true?

The events that unfold in this world can be entirely explained by science.

1: Tremendously Doubtful – 2: Doubtful – 3: Slightly Doubtful – 4: Slightly Likely – 5: Likely – 6: Extremely Likely

The principles of science provide order and predictability to the world.

1: Tremendously Doubtful – 2: Doubtful – 3: Slightly Doubtful – 4: Slightly Likely – 5: Likely – 6: Extremely Likely

The course of evolution follows certain paths, and is not just the result of random processes.

1: Tremendously Doubtful – 2: Doubtful – 3: Slightly Doubtful – 4: Slightly Likely – 5: Likely – 6: Extremely Likely

Orderly vs. Random Scientific Theories (Adapted from Rutjens et al., 2010; Measured in Study 3)

Theory 1 (Random)

“Evolutionary theory posits that the way our world and the universe work springs from

