**Supplemental Materials**

**Awe and Scientific Explanation**

**by P. Valdesolo et al., 2016, *Emotion***

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**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, *β* = -.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, *β* = .481, *p* = .015) and the amusement conditions (*b* = .354, *β* = .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, (Mawe = 4.11, SDawe = 1.7, Mamuse = 4.04, SDamuse = 1.65, MNeut = 4.0, SDneut =1.67; *F*(2,361) =.135 , and theism correlated significantly with reported scientific orderacross 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, *β* = -.532, *p* < .001), and also a significantly greater effect of theism for those in the awe condition compared to the neutral condition (*b* = .203, *β* = .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, (Mawe = 3.54, SDawe = 1.81, MNeut = 3.79, SDneut =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 (Mawe = 4.67, SDawe = 1.8; MNeut = 4.4, SDneut = 1.81; t = .872), a significant main effect of theism with theists showing significantly greater endorsement of Theory 1 than non-theists (*b* = -.489, *β* = -.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 ((Mawe = 3.93, SDawe = 1.67; MNeut = 3.78, SDneut = 1.61; *t =* .528 ), a significant main effect of theism (*b* = .220, *β* = .248, *p* = .004) and a significant interaction of condition and theism (*b* = -.488, *β* = -.383, *p* = .001, 95% 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 f2 = .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, β = .332, p = .004) whereas emotion condition did not affect theists’ ratings.

*Graph of Results*

% preferring orderly version

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 evolution; a process in which inheritance, procreation, and natural selection play an important role. This process is generally unstructured and random, in which unpredictable features of the natural environment determine how life evolves. A wide array of circumstances determines how life evolves, and coincidence plays a large part in this process.”

Theory 2 (Orderly)
“Evolutionary theory posits that the way our world and the universe work springs from evolution; a process in which inheritance, procreation, and natural selection play an important role. This process is generally structured and not the result of randomness; if evolution would be replayed, results would inevitably be similar to the present state of affairs. The course of evolution follows certain paths and is therefore best described as a mechanism that is bound to have specific structural characteristics.”

*Theory Fit*

Choose the theory that in your view provides the best framework for explaining the origins of life on this planet.

Theory 1 - Theory 2

To what extent does Theory 1 fit with your views on the origins of life on this planet?

1:Not At All – 2 – 3 – 4:Moderately – 5 – 6 – 7:Extremely      

To what extent does Theory 2 fit with your views on the origins of life on this planet?

1:Not At All – 2 – 3 – 4:Moderately – 5 – 6 – 7:Extremely      