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Temporal Context and the Experience and Memory of Art

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Abstract

One aspect of context on cognition and memory that has been understudied is the influence of temporal context. The temporal contexts used in this study were different times of the year. More specifically, given that we were dealing with a largely Roman Catholic population, we operationalized temporal context in terms of two religious seasons, Lent and Ordinary Time. For this study, we assessed experience of, and memory for, representational and abstract art as a function of whether there was temporal congruity or incongruity. Temporal context did influence memory for perceptual details but not the experience of art during viewing, or gist and autobiographical memory. Thus, temporal context can influence cognition, but the scope of this influence is limited.

Keywords: temporal context; change over time; levels of representation

Introduction

Context is a critical aspect of human cognition. In vision, the Ebbinghaus illusion demonstrates how perception of an object's size depends upon the relative sizes of all the objects in the field of view (c.f. Münsterberg, 1900). In hearing, linguistic context can aid the identification of words (e.g., Kintsch & Mross, 1986). In attention, objects that are inconsistent with scene context receive priority (e.g., Loftus & Mackworth, 1978; Vo & Henderson, 2009). In memory, information may be easier to remember when the encoding and retrieval contexts are the same (e.g., Godden & Baddeley, 1975). Moreover, changes from one context to the next may disrupt performance, as when walking through doorways causes forgetting (Radvansky & Copeland, 2006). In all these examples, context is defined physically within some set of stimuli (shapes, words, or objects) and/or the physical situation in which the observer views those stimuli. Such contexts are therefore often defined using terms like spatial context, as with environment-specific learning (e.g., Smith, Glenberg, & Bjork, 1978), or as with linguistic context, such as with paired-associate learning (Calkins, 1894).

The aim of the current study was to explore the influence of **temporal context** on cognition and memory. To do so, we leveraged natural contingencies in religious practice throughout the calendar year to broadly ask how a time period during which objects, in this case works of sacred art, are encountered affects how they are thought about. This has not been extensively studied in cognitive science. Our hypothesis was that different temporal contexts, operationalized here as different times of year, will be more likely to activate some types of mental content associated with them. We based this on the possibility that particular periods of time may prime

associated semantic structures, which would then facilitate the processing of content that is congruent with it. That is, when information is **temporally congruent** with a context, then cognition and memory should be aided compared to when information is more **temporally incongruent**. That is, cognition would be supported for materials that have a semantic relationship with one temporal context but not another. To take a simple example, as we write this report in the dead of winter, concepts of snow and cold-weather apparel may be facilitated relative to those currently yearned-for summer months.

The current study was conducted as part of a larger study of perception, understanding, and memory of visual art, such as paintings and sculptures. Art provides a rich testbed for investigating temporal context and the parameters that may govern its influence. Art portrays story/meaning which can be more or less consistent with the time period in which it is viewed. Art is both perceptual and conceptual, allowing us to consider the effects of temporal context at different levels of representation. Art is also stylistic and can range from highly pictorial to very abstract, enabling us to explore how effects of temporal context may depend on differing degrees of cognitive analysis.

For this project, representational and abstract art pieces were used because they elicit different cognitive processes in terms of how people try to understand them (Schepman & Rodway, 2021). Representational art more directly conveys to the viewers the events being represented, whereas abstract art requires cognitive effort on the part of the viewer to understand how the work refers to the labeled event.

Here, we assessed cognitive processing of sacred art that depicted religious stories related to the life and death of Jesus. These artworks were viewed during two temporal contexts in the Roman Catholic calendar. At different periods in this calendar, different stories become more or less salient (e.g., Jesus' crucifixion at Easter versus a Sunday in July). By conducting this study at a Catholic university, we could recruit a sample that would have substantial prior knowledge of (or at least exposure to) both the depicted stories and the different times of the liturgical year. Thus, temporal context here was easily identified, and our participants were embedded in the changing religious seasons.

Our materials were photographs of two multi-piece religious art installations. One was a set of representational paintings, and the other was a set of abstract sculptures (see Figure 1 for examples). Both installations conveyed events from the life of Jesus and focused on the events surrounding his trial and execution. These are the events that are the focus of the liturgical season of Lent. Thus, our temporal contexts

were (a) Lent, and (b) Ordinary Time. With our materials, Lent served as our temporally congruent condition, and Ordinary Time served as our temporally incongruent condition. People were tested in different groups, depending on the temporal context that was operating at the time.

Our measures focused on participants' **experience** of the materials as well as their memory for them. In terms of the immediate experience of **art viewing**, we focused on the artworks' perceptual qualities, the participants' inferences made at the time of viewing, and their feelings of engagement with the art. Subsequent memory assessments were collected at three time points (immediately, 1 day, and 7 days after viewing). This testing was done for both **perceptual memory** and **gist memory** for the materials themselves as well as **autobiographical memory** for each person's prior responses. In terms of temporal context, our predictions were that ratings of experience and memory would be superior in temporally congruent than in incongruent contexts.

Memory was assessed to reveal aspects of long-term and enduring understanding. Importantly, memory and understanding occur at different **levels of representation**. As an example of this, in text comprehension, information can be represented at the surface form (verbatim memory), textbase (propositional code), and event model (referential memory), each with different qualities (e.g., Radvansky & Zacks, 2014; Schmalhofer & Glavanov, 1986).

Here, we considered three levels of understanding appropriate here. The first was superficial understanding, as indexed by **perceptual memory**, including perceptual characteristics (color, size, angles, etc.), and what people know about the physical object itself. While such superficial understanding should be stable across people, in terms of temporal context, our prediction was that people would be more likely to attend to and remember perceptual details during a temporally congruent context.

The second level of representation we considered was interpretive understanding and is indexed here by **gist memory**. For instance, "This depicts human suffering." This level of representation provides insight into what the art communicates to that viewer about the referenced event, including both information in the piece itself and the inferences drawn during comprehension. The specific interpretive understandings may vary from person to person given that different people are likely to infer different things. That said, there should also be some consistency across viewers. We predicted that such inferences would be more likely to be retained during temporally congruent contexts.

Finally, the third level of understanding we analyzed was a person's **autobiographical memory** of their experience with a piece of art. Specifically, we focused on participants' remembered feelings of engagement with a piece of art. We predicted that during temporally congruent contexts people would be more likely to apply their own experience to the materials at the time of testing and would therefore also be more likely to remember those experiences.

One final point is that we tested memory at different delays. One of the most important qualities of memory is that it changes over time (Ebbinghaus, 1885); there is a **forgetting curve**. Recent work suggests that different levels of information show different patterns of forgetting (Fisher & Radvansky, 2018; Radvansky, Doolen, Pettijohn, & Ritchey, 2022). Our prediction was that there deeper levels of representation would result in more linear forgetting patterns.

Method

Participants
We recruited 153 undergraduates (104 identified as female) from the University of Notre Dame to participate in the study. All participants were compensated with course credit. Informed consent was obtained from each person and our Institutional Review Board approved all procedures.

Materials
All participants viewed photographs of two existing art installations. Luigi Gregori's *Stations of the Cross* (1874–77) is made up of fourteen panels painted in oil on wood that pictorially convey the Passion of Christ. This work is representational, with its depictions being easily recognized due to their resemblance to their physical counterparts.

Philip Rickey's *The Life of Christ/Cycle of Life* (2017) is composed of stone megaliths arranged into 8 "scenes" set into a natural landscape that each suggest events and characters in the life of Jesus. This abstract work does not provide a realistic depiction of visual or physical reality, but instead uses shapes, colors, and forms to suggest certain content.

While both installations depict core Christian narratives, they provide contrasts in location, medium, and style (see Figure 1 for examples of each). Each photograph was placed on a white background with a short title added that identified the depicted event (e.g., Jesus accepts the cross, Jesus is nailed to the cross, etc.).

Figure 1: Examples of the representational and abstract art pieces used. Both depict Jesus carrying the cross.

Design and Procedure
The study was conducted online using Qualtrics to display the materials and collect responses. Thus, people completed the study using their own devices and in locations of their choosing.

Participants were assigned to one of two conditions based on the timing of their participation in the study.

People in the *temporally congruent* condition (*n* = 78) participated during the 40-day season of Lent that precedes Easter. This is a liturgical season of prayer, fasting, and almsgiving in the Roman Catholic calendar that serves as a time of preparation to celebrate Christ's resurrection. People in this group completed the study between February 17 and April 1, 2022, or between February 22 and April 9, 2023.

Participants in the *temporally incongruent* condition (*n* = 75) completed the study during Ordinary Time which encompasses the periods of time in the church calendar that do not include Lent/Easter or Advent/Christmas. People in this group participated between September 1 and October 15, 2022 or between February 13 and February 21, 2023.

These temporal contexts are ones many of our participants would have been cognizant of and have sufficient semantic memory structures to make it meaningful. To emphasize the temporal context for our participants, prior to seeing the art pieces, they were either asked:

"As the Easter season and Lent are about to start, how do you feel about this time of the year? If you and your family participate in services during Lent, how do you plan on participating this year? How do you think Easter will be celebrated at your school environment?"

Or

"Now that we are in Ordinary Time in the church calendar, how do you feel about this time of year? If you and your family participate in services during Ordinary Time, how do you plan on participating this year? How do you think Ordinary Time will be evident in your school environment?"

People then viewed the 22 art pieces one at a time. The representational (paintings) and abstract (sculptures) were presented in separate blocks in counterbalanced order across participants. Within each block the artworks were presented in chronological order with respect to the events depicted.

While viewing each piece, people were asked a set of questions. First, they were asked about the piece itself. Some of these items focused on perceptual details (e.g., "How many halos are there in the painting?" or "What color is the stone representing the cross?") and others on a gist interpretation (e.g., "What do the standing pillars in the sculpture represent?"). Three perceptual- and three gist-based questions were asked of each piece. Then, they were also asked to indicate how engaged they were with the piece. People were simply asked "How emotionally engaging do you find this painting/sculpture?" using a 0-100 Likert scale.

Later, memory was tested. This was done at three delays: Day 0 (immediately after viewing the artworks), Day 1 (between 24 and 30 hours after viewing), and Day 7 (one week after viewing). For Days 1 and 7, people were sent email links to surveys with the memory questions. For each memory test session, a different set of 6-8 artworks were included. Which pieces were tested at each delay were counterbalanced across participants.

Memory for items was tested by first providing the name of an artwork to recall that matched the title given during initial viewing. Three memory questions (2 multiple choice and 1 fill-in-the-blank) focused on perceptual features and another three focused on gist. An additional question was autobiographical and asked "what was your engagement with this painting/sculpture when you first saw it?"

Finally, participants were asked to self-report their interest in art and their religions involvement on a 0-100 scale. They were additionally asked to provide demographic information regarding their religious identity.

Results

For our analyses, we first considered **characteristics of our sample**. Second, we analyzed **experience while viewing the art** as a function of temporal context. Third, we assessed memory data as a whole, with an emphasis on **temporal context**. Fourth, we assessed memory by considering each of the **levels of representation**, namely perceptual, gist, and autobiographical memories. Finally, we report any notable influences of **individual differences** on responses.

Sample Characteristics

The mean scores for self-reported interest in art and religious involvement (out of 100) were 44.58 (*SE* = 2.50) and 47.37 (*SE* = 3.09), respectively (distributions are illustrated in Figure 2). Although this research was done at a Roman Catholic university, meaningful variability in religious identity and involvement were observed, although we acknowledge the majority came from Abrahamic religious traditions. To wit, 69 (69%) identified as Roman Catholic, 13 (13%) as Christian (non-Roman Catholic), 16 (16%) as None, and 2 (2%) as Other.
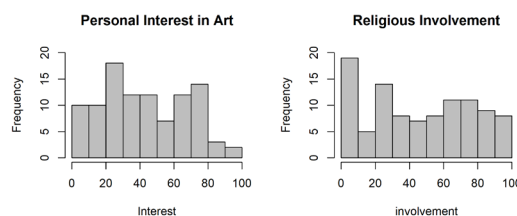
Figure 2. Levels of interest in art and religious involvement.

Participants had more familiarity with representational (*M* = 40.20, *SE* = 3.33) than abstract art (*M* = 11.51, *SE* = 1.60). Due to technical issues, we do not have personal interest, religious involvement/affiliation, or familiarity data from 53 participants, (28 in the Temporally Congruent group).

Art Viewing

The data on engagement with the art during viewing was submitted to a 2 (Art Type) x 2 (Temporal context) ANOVA. The engagement scores for representational art (*M* = 55.62, *SE* = 1.83) were higher than those for abstract art (*M* = 31.79, *SE* = 1.70), $F(1, 151) = 238.64$, $p < .001$, $\eta_p^2 = .61$. Thus,

people felt more engaged when viewing the representational paintings than the abstract sculptures.

There was no main effect or interaction involving Temporal Context, both $ps \geq .56$. Thus, there was no support for the prediction that people would be more engaged with the art for temporally congruent contexts.

Our measures of interest in art and religious involvement were correlated, $r = .30$, $p = .002$, with more religiously involved people also showing more interest in art. Reported level of engagement with the art was correlated with interest in art, $r = .20$, $p = .04$. Reported religious involvement was correlated with overall engagement with the art, $r = .45$, $p < .001$. Considering art types separately, religious involvement was correlated with engagement with both representational, $r = .48$, $p < .001$, and abstract art, $r = .29$, $p = .004$.

Memory

The memory data were submitted to a 2 (Temporal Context: Lent vs. Ordinary Time) X 3 (Delay: 0, 1, or 7 days) x 2 (Art Type: Representational vs. Abstract) x 2 (Level of Representation: Perceptual vs. Gist) mixed ANOVA, with the first factor being between subjects, and the others within.

Temporal Context. People in the temporally congruent context ($M = 0.48$, $SE = 0.01$) did not remember more than those in the incongruent context ($M = 0.46$, $SE = 0.01$), $F(1,151) = 2.55$, $ps \geq .11$, $\eta_p^2 = .02$. Also, no interactions involving Temporal Context were significant (all p's > .18).

Delay. As seen in Figure 3, and as expected, memory declined with Delay, $F(2, 302) = 133.97$, $p < .001$, $\eta_p^2 = .47$. Except as noted, no interactions involving Delay were significant (all p's > .10).
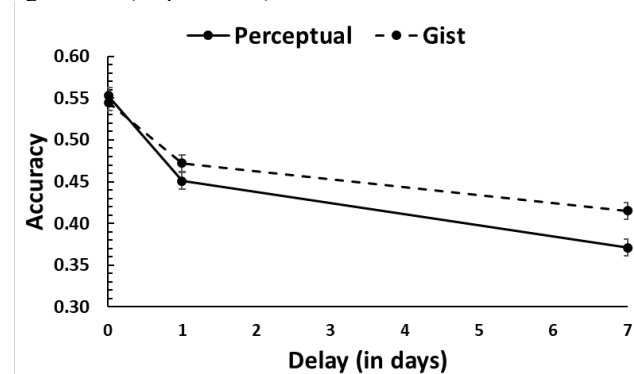
Figure 3. Forgetting for different levels of representation.

Level of Representation. Memory for gist ($M = 0.48$, $SE = 0.01$) was better than for perceptual detail ($M = 0.46$, $SE = 0.01$), $F(1, 151) = 6.65$, $p = .01$, $\eta_p^2 = .04$. Also, as is clear in Figure 3, perceptual details were forgotten faster than gist information, as supported by the Level of Representation x Delay interaction, $F(2, 302) = 4.56$, $p = .01$, $\eta_p^2 = .03$. Except as noted, no interactions involving Level of Representation were significant (all p's > .10).

Art Type. Abstract art was remembered better than representational art, $F(1, 151) = 7.43$, $p = .007$, $\eta_p^2 = .05$. However, Art Type varied across Level of Representation, $F(1, 151) = 20.09$, $p < .001$, $\eta_p^2 = .12$. As seen in Figure 4, there was no difference in perceptual and gist memory for representational art but there was greater gist memory for abstract art. This may be because people need to exert more effort to understand abstract art. No other interactions involving Art Type were significant (all p's > .18).
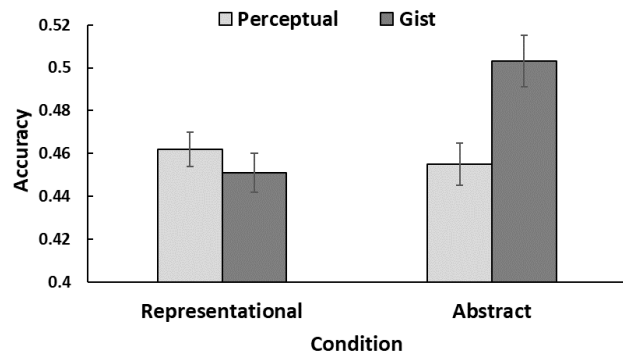
Figure 4. Memory for different levels of representation as a function of art type.

Levels of Representation

To get a better understanding of how context affects memory, we broke the data down into memory for perceptual qualities, interpretive gist, and autobiographical experience.

Perceptual Memory. For perceptual details, memory was better in the temporally congruent ($M = .48$, $SE = .01$), than the temporally incongruent context ($M = .44$, $SE = .01$), as evidenced by the main effect of Temporal Context, $F(1, 151) = 4.48$, $p = .04$, $\eta_p^2 = .03$. Thus, for perceptual details, memory was better when the temporal context was consistent with the semantic content of the art. This knowledge could be leveraged more easily to support requisite memory processes. In addition, memory declined over time, $F(2, 302) = 111.03$, $p < .001$, $\eta_p^2 = .42$, as expected.
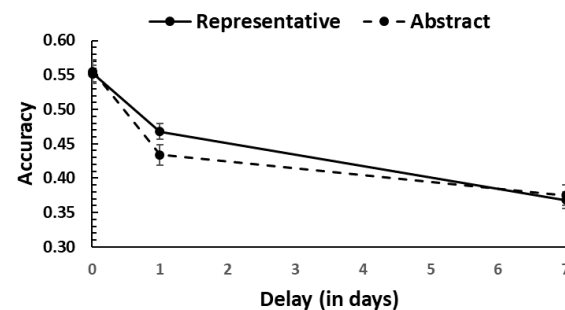
Figure 5. Forgetting perceptual details for art types.

Memory for Gist. For inferential gist, unlike perceptual details, there was no influence of temporal context, $F(1, 151) = 0.71$, $p = .4$, $\eta_p^2 = .005$.

That said, memory declined over time, $F(2, 302) = 46.04$, $p < .001$, $\eta_p^2 = .23$, as expected. Moreover, people had better memory for abstract ($M = .50$, $SE = .01$) than representational art ($M = .45$, $SE = .01$), as evidenced by the main effect of Art Type, $F(1, 151) = 23.15$, $p < .001$, $\eta_p^2 = .13$. Again, this may be because for abstract art, people need to spend more effort understanding what they were looking at.

Memory for Autobiographical Experience. There was no main effect of Temporal Context on memory for prior engagement, $F < 1$, but there was a Delay x Temporal Context interaction, $F(2, 302) = 5.06$, $p = .007$, $\eta_p^2 = .03$. For the temporally incongruent condition, with longer retention intervals, people tended to overestimate their initial engagement with the art. In contrast, for the temporally congruent condition, memory for their level of initial engagement did not change (see Figure 6).
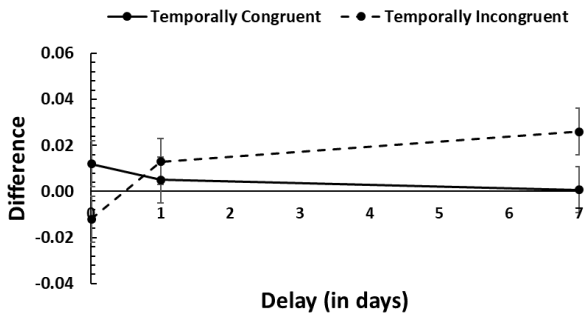

Figure 6. Forgetting of prior engagement experiences.

The main effect of art type was significant as people overestimated their memory of their original level of engagement for the abstract art, and underestimated it for the representational art, $F(1, 151) = 60.79$, $p < .001$, $\eta_p^2 = .29$. Moreover, as can be seen in Figure 7, while this difference was present at all delays, there was a larger change over the first 24 hours for memories of their engagement for abstract art. This was supported by a Delay x Art Type interaction, $F(2, 302) = 7.92$, $p < .001$, $\eta_p^2 = .05$. Thus, memory for representational art experiences are slightly more veridical, than memories for abstract art.
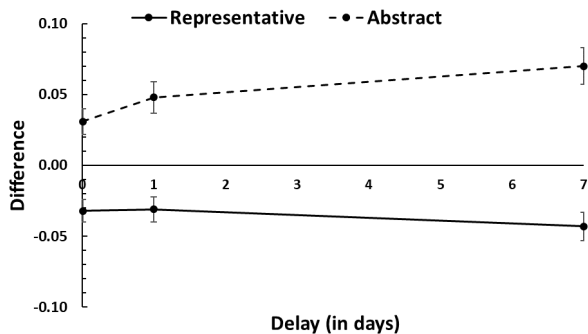

Figure 7. Difference between memory of artwork engagement and original engagement (e.g., positive values convey more positive memory of experience than the original).

Role of Religious Involvement and Art Experience. Across temporal contexts, interest in art was not correlated with memory, all $ps > .18$. However, religious involvement was correlated with overall interpretive gist memory, $r = .24$, $p = .019$. There was also a marginally significant correlation with memory for representational art, $r = .182$, $p = .069$. There appeared to be no influence of temporal context on these relationships.

Discussion

In this study we assessed whether experience and remembering were affected by temporal context. In terms of experience, we found that although people reported being more engaged when viewing representational than abstract art, this was largely unaffected by temporal context. Thus, there was no support for our first prediction.

In terms of overall memory, temporal context had a small impact on performance. Specifically, was no major difference in overall memory during temporally congruent or incongruent contexts. Thus, the bias for improved performance when the global temporal context was congruent with the nature of our materials (i.e., sacred art) was small at best. The greater activation of temporally consistent information in semantic memory was not sufficient to greatly aid performance.

The influence of temporal context on memory was observed when we considered perceptual detail and autobiographical memories, but not for inferential gist. This suggests that temporal context may more strongly activate relevant semantic memories, which can then be used as a framework to aid the encoding and retention of low-level information and memories for experienced emotions. Both of these are more embodied forms of information. This was in line with our prediction.

However, the influence of temporal context on memory was limited in scope. It did not have a large influence on inferential gist memory for a piece of art. These types of memories are driven more by internally generated thoughts, and, thus, may not be as dependent upon semantic information to organize and structure that knowledge. As such, these memories are more independent of the influences of changes in temporal context.

Understanding of the art (gist memory) was influenced by the material type, with it being greater for abstract than representational art. This may be because people exert more effort trying to understand abstract pieces leading to better memory, possibly a form of desirable difficulty in memory (e.g., Bjork, & Bjork, 2020). There was also a difference in memory for artwork types for autobiographical experiences, where people overestimated their initial engagement for abstract art and underestimated for representative art.

For all levels of representation, memory was affected by delay. This is hardly surprising. We have known for a long time that memory gets worse over time (Ebbinghaus, 1885). While there was some evidence for different rates of forgetting over the week, the patterns of forgetting were similar across conditions, at least in terms of the degree to which they resemble a classic power function. At no point did we find any evidence in this study of a shift to more linear forgetting patterns, although this has been found with verbal materials (e.g., Fisher & Radvansky, 2018).

In terms of the individual reports of interest in art and involvement in religion, we found that our results were largely unrelated to these responses, although religious involvement was slightly related to gist memory. There was also a hint that reported religious involvement was related to memory for art, particularly for our representational art paintings. This is sensible given that this study focused on sacred art. The more involved with religion a person is, the more likely that they would bring this semantic knowledge to bear on the processing and memory of the art. With our representational art, because less mental effort would be required to interpret the pieces themselves, this would leave capacity for applying such personally relevant knowledge.

On-Going and Future Work

We view the current work as a launching point for further research exploring experience and memory for different types of art and the role of context. In addition to continuing to more systematically explore the impact of temporal context (at different scales), we are also currently collecting data that involve the manipulation of different spatial semantic contexts. In the real world, these consist of a chapel, an art museum, and an office. In the virtual world, these consist of a church, an art museum, and a warehouse. Moreover, in addition to continuing to explore the different cognitive processes involved in the comprehension and memory of different types of art, we are also exploring how these cognitive processes are affected by whether the art refers to sacred (e.g., The raising of Lazarus) or secular events (e.g., The Lunar Landing). Specifically, given that our temporal contexts (and now some of our spatial contexts) are defined by religious qualities, we would expect those contexts to influence comprehension and memory for sacred art, but not secular art. Finally, we are preparing to address these questions in a broader demographic context to evaluate individual differences and potential generalizability to more diverse religious and non-religious groups.

Acknowledgments

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