



## Empowering Diverse Faith Communities through Engagement in Participatory Science

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Developing successful strategies that promote meaningful dialogue between scientific and religious communities is arguably one of the most urgent issues of our time. Perceptions of science as hostile to religion have led governments to adopt educational policies that are not in the best interest of communities and adversely affect participation in science by people of faith, disproportionately excluding minorities and women (e.g., Bolger and Ecklund 2022; Barnes and Brownell 2018; Ecklund et al. 2019). Diversifying science requires respectfully and constructively engaging with diverse worldviews and cultures. One way this can be accomplished is through collaborative projects that facilitate building relationships across communities that might not otherwise interact.

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## Participatory Learning

In recent decades, it has become increasingly possible for people of all ages and from all walks of life to participate in real research projects alongside professionals in many fields of study. Citizen science and community science are examples of participatory science that engage members of the general public in advancing knowledge and/or problem-solving with scientists and other specialists. Although there is no clear distinction between community science and citizen science, community science often refers to a global movement through which scientists and nonscientists alike make observations and collect data to help answer some of our planet's most critical questions. Research tends to be driven and controlled by the needs of local communities, is often carried out in partnerships with academic or other organizations, and is characterized by local knowledge, social learning, collective action, and empowerment (e.g., National Academy of Medicine, n.d.; Community Science, n.d.).

On the other hand, citizen-science projects are typically developed by research teams that require human help to extract information from large quantities of data. The label *citizen* is unfortunate, as it may have negative implications, and participation does not require an individual to be a citizen of any particular place. Because of this, the label *participatory sciences* has been suggested to describe a variety of research efforts that depend on knowledge, insights, or observations from members of the public (Association for Advancing the Participatory Sciences 2024). Online platforms for participatory science enable people to contribute to research projects that appeal to them from anywhere and at any time (e.g., Zooniverse, n.d.a; NASA, n.d.). Furthermore, many of these research projects include the humanities as well as the sciences. In this article, we will use the descriptor *participatory* except when it is necessary to use *citizen science* to refer to specific initiatives, organizations, or products that have used this terminology.

Along with enabling projects that would be impossible without the help of many individuals, participatory science benefits volunteers in critically important ways. Most science is learned in informal environments outside of school (Falk and Dierking 2010); however, the internet is rife with misinformation about science. Through participation in real scientific research, volunteers learn about the process of science while contributing to the pool of human knowledge. This can be an empowering experience for participants and an effective way to build trust and positive relationships among diverse individuals and communities by putting a human face on both the research and researchers. In the words of Johann Wolfgang von Goethe, “Who wants to understand the poem must go to the land of poetry; who wishes to understand the poet must go to the poet’s land” (Libquotes, n.d.). We learn about others best when we enter their communities and participate in their activities.

An increasing number of educators are also providing students at all levels with opportunities to participate in real research, a practice that can benefit students and teachers alike. Course-based undergraduate research experiences (CUREs) offer students hands-on experience doing original research and offer faculty the opportunity to generate new information within their disciplines (Auchincloss et al. 2017). Research shows that CUREs, particularly at the introductory-course level, increase student cognitive gains and interest in science and may be a way to improve the diversity of the scientific community (e.g., Bangera and Brownell 2014; Dolan 2014; Auchincloss et al. 2017).

### **Public Participation in Research through Zooniverse**

Zooniverse is the largest and most popular online platform for participatory science. It began with the 2007 launch of *Galaxy Zoo*, a project that invited volunteers to help classify different types of galaxies (Lintott et al. 2008). Thus far, *Galaxy Zoo* has produced over 70 academic publications on subjects such as the sharing of datasets, discoveries of new types of galaxies, deepening our understanding of how galaxies evolve over time, and much more (Zooniverse, n.d.f). Over the years, Zooniverse has expanded to include many areas of research in disciplines such as biology, medicine, physics, the social sciences, and more and has produced hundreds of academic publications in top journals, including “Meta Studies” that explore the use of Zooniverse in formal and informal education settings, participant pathways from dabblers to deep engagers, participant motivations, etc. Meta Studies also report advances in machine-learning techniques that have been made possible by human classifications (Zooniverse, n.d.f). Over 2.6 million people are registered participants on Zooniverse, working alongside the hundreds of researchers who have led over 400 Zooniverse projects to date.

At any given time, volunteers can choose from around 90 active projects in diverse fields of study across the sciences and humanities, including a wide selection for virtually all ages. Project participants classify or annotate different subjects, which might be images, photos, texts, graphs, or videos, depending upon the requirements of the research project. Zooniverse can be used by individuals or groups in both formal and informal learning environments. The website provides many resources for further learning, including materials for teachers at all educational levels, and a tool that can be used by anyone interested in building their own research project (Zooniverse, n.d.e). Projects that are launched on the main Zooniverse website undergo several reviews by the Zooniverse leadership team; however, the project-builder tool can also be used to build smaller projects of interest to specific communities.

Each project on Zooniverse combines contributions from many individual volunteers, relying on a version of the “wisdom of crowds” to produce reliable and accurate data. Projects have their own tutorials and discussion boards

that provide opportunities for volunteers to interact with each other as well as the research teams. Interactions with scientists in particular can help build confidence in individuals who doubt their own abilities to contribute to science in meaningful ways. Many of the most interesting discoveries from Zooniverse projects have come from discussions between volunteers and researchers; some participants have even achieved coauthorship on resulting research publications. Examples from the project Galaxy Zoo include the identification of previously unknown types of extragalactic objects known as Hanny's Voorwerp and Green Peas (e.g., Cardamone et al. 2009; Lintott et al. 2009).

### **Engaging Faith-Based Communities in Citizen Science through Zooniverse**

The features described in the previous section make Zooniverse an ideal platform for helping diverse audiences engage with science in nonthreatening ways and in their own environments, enabling wonderful opportunities to increase public understanding of science among faith communities and foster a more diverse STEM population. Most communities of faith have adult, youth, and/or intergenerational classes or other programs to help relate religious learning to societal issues. Furthermore, an increasing number of seminaries have received support to integrate scientific topics into their courses and programs through the American Association for the Advancement of Science's Dialogue on Science, Ethics, and Religion (DoSER) Science for Seminaries program (American Association for the Advancement of Science's Dialogue on Science, Ethics, and Religion 2020). All of these programs provide superb occasions to address apprehensions about science through active participation in the scientific process and to help individuals relate science and religion in positive and meaningful ways.

Engaging Faith-based Communities in Citizen Science through Zooniverse (for simplicity, Engaging) was a funded eighteen-month initiative to create intentional and sustainable pathways for faith-based communities to engage with science through the Zooniverse platform (Wolf-Chase 2022). We use the word *initiative* rather than *project* to avoid confusion with individual research projects on Zooniverse. The principal intentions of the initiative were to cultivate new relationships and build trust with diverse religious communities by inviting them to become collaborators in scientific discovery and to demonstrate that participating in science can be fun, engaging, and empowering.

At the outset of Engaging, a six-person multidisciplinary advisory board that included representatives from the Abrahamic faith traditions, scientists, and people experienced in science and religion or interfaith dialogue was established to help guide the initiative. Together with Engaging's leader, advisory board members helped advertise Engaging through their respective venues and among their communities, including but not limited to the Institute on Religion in an

Age of Science (IRAS 2020); the Zygon Center for Religion and Science at the Lutheran School of Theology at Chicago; the Vatican Observatory; the Illinois Holocaust Museum and Education Center; The Clergy Letter Project (n.d.a.), an endeavor to demonstrate that religion and science can be compatible; the American Academy of Religion; the Interfaith Youth Core; and various media of organizations dedicated to science and religion dialogue (e.g., Lutheran Alliance for Faith, Science, and Technology, n.d.; Presbyterian Association on Science, Technology and the Christian Faith, n.d.).

Throughout the duration of the initiative, Engaging's leader organized and led online workshops to showcase the capabilities of Zooniverse; generated awareness of the initiative through articles, blogs, newsletters, and website contributions; and facilitated new relationships and ideas for broadening engagement. In total, these combined efforts reached at least 100,000 individuals who may not have been attentive to other venues promoting participatory science.

The most serious limitation was that Engaging took place during the COVID-19 pandemic, such that the vast majority of presentations, tutorials, and events had to be conducted remotely. In some respects, this made participation in Zooniverse a natural fit to the online modes of operation communities had to learn to navigate. However, since faith communities struggled just to maintain themselves and their ongoing activities during the pandemic, introducing entirely new programmatic elements was not possible for many. Unfortunately, this resulted in many one-time events and fewer sustained efforts. Communities recruited to participate already had some interest in science, as well as programs in place that could accommodate scientific learning opportunities. Even so, the participatory aspect that enabled individuals to engage with the process and collaborative nature of science was, by and large, new.

## **Models for Engagement in Participatory Science**

The Engaging initiative produced models for integrating learning about science through participation in Zooniverse across assorted venues (Wolf-Chase 2022). A few of the successful ways Zooniverse projects were integrated into seminary, interfaith, and youth and family programs are detailed in this section.

### ***Seminary Education***

The capabilities of Zooniverse were showcased to seminaries who applied for, or received, DoSER Science for Seminaries grants (Science for Seminaries 2024). Cosmology, anthropology, evolution, climate, and ecology are all scientific topics represented on the Zooniverse platform that are relevant to theological themes. A particularly successful outcome of this outreach was the decision by a professor at Hood Theological Seminary, a historically black graduate and professional school sponsored by the African Methodist



Episcopal Zion Church, to integrate several research projects into her course on the history of Christianity in the United States, a course taken by all seminary students at Hood.

During the spring semester of 2020, students were assembled into small teams and asked to choose a project from a given list. They were then asked to participate in their chosen project over the course of the semester while reflecting along with other team members on what they were learning and its relevance to course themes. Students initially were asked to produce podcasts on their experiences; however, pandemic constraints necessitated that the students write papers instead. For example, students working on Hubble Asteroid Hunter (Garvin et al. 2022; Kruk et al. 2022) reflected on the potential threat of asteroids to life on Earth; students working on Notes from Nature (Matsunaga, Mast, and Fortes 2016) reflected on the relationship between plant and animal habitat loss and human health; and students working on Parasite Safari reflected on the church's ecological responsibility. Students who worked on Snapshot Elephants for Africa related social behaviors of male elephants to structures in the Black church (S. Grant, personal communication, October 25, 2021).

Features that made this model successful include providing students with the opportunity to choose projects of interest; sustained engagement in projects over the course of the semester; and collaboration with other students, which reflects the collaborative nature of science. What could have benefited the experience further was more direct and sustained interactions with the project scientists beyond the discussion boards.

### ***Interfaith Programs***

Many interfaith organizations are devoted to mobilizing diverse religious communities toward action on scientific issues that intersect with issues of social justice. For example, Interfaith Power and Light (n.d.) coordinates affiliated interfaith organizations across the United States that are dedicated to environmental justice. These organizations provide resources to empower communities to take climate action through local projects. Although most of these actions involve in-person efforts, for some people, including but not limited to the elderly and infirm, online participation might be more appropriate. This was especially true during the pandemic, when Zooniverse leadership received expressions of gratitude from individuals around the world seeking to engage in meaningful activities from the safety of their homes.

In April 2021, the Engaging leader cohosted a webinar with Chicago-based environmental organizations Faith in Place and the Chicago Muslims Green Team to demonstrate how individuals could take climate action during the pandemic and beyond by participating in one or more of the many environmental research projects available on Zooniverse, including the local Chicago Wildlife

Watch (faithinplace 2021). On many occasions, Zooniverse research teams have coordinated large events involving challenges to participants to achieve a certain number of classifications on specific projects. Future efforts could specifically target interfaith organizations dedicated to proactive climate action. Such an event, if advertised through prominent media outlets, would be a powerful demonstration of cooperation across diverse faith traditions and would stand in stark contrast to the pervasive culture wars and messages of polarization.

### **Youth and Family Programs**

Engaging has produced several models for integrating Zooniverse projects into youth and family programs of faith communities. A Lutheran pastor in Texas with a strong science background had his confirmation class vote on a Zooniverse project on which they would all work. The class collectively chose Penguin Watch, a popular environmental science project (Arteta, Lempitsky, and Zisserman 2016; Jones et al. 2018, 2019; Jones et al. 2020). Since not all students would have chosen this project, the degree of engagement varied considerably, and the pastor decided that in the future, students would have individual choices among projects and be encouraged to make greater use of the discussion boards to interact with team scientists.

In general, pastors and youth leaders will not have scientific training, nor should this be an expectation. Most will need to work closely with a scientist to implement Zooniverse effectively. In some cases, scientists might be pulled from local congregations, similar to the models produced by the Scientists in Congregations initiative (Scientists in Congregations, n.d.). Scientists could also be recruited remotely from Zooniverse project teams to work directly with religious leaders. A good, albeit one-time, example took place in February 2021, when Engaging's leader worked remotely with a youth leader to colead a session themed around "God and Physics" with middle- and high-school youth groups at a Presbyterian church in California. The scientist introduced students to Zooniverse and led them through a tutorial on classifying galaxies in Galaxy Zoo, highlighting the potential for students to discover new objects or new types of galaxies, while the youth leader encouraged students to reflect on how the vastness of the universe in time and space might expand and deepen the way they thought about God.

Zooniverse also provides an excellent platform for families to learn together. Hood Theological Seminary and the organization Families and Communities Together have co-organized minority-serving intergenerational summer science camps (Hood Theological Seminary, n.d.). In 2020 and 2021, Engaging's leader conducted online sessions with Zooniverse on Zoom, highlighting projects that were related to camp themes. The 2020 science theme was space, which facilitated discussion of nascent star clusters that were discovered by volunteers

working on the Milky Way Project (Kerton et al. 2015; Wolf-Chase and Kerton 2015; Wolf-Chase et al. 2021). In keeping with the 2021 focus on ecology and the climate, the Zooniverse project Fossil Atmospheres was used to demonstrate how people around the world are helping to track how Earth's atmosphere has changed over time (Soul et al. 2018).

## **Evaluation of Engaging**

The summative evaluation report for the Engaging initiative can be accessed and downloaded online at [informalscience.org](https://informalscience.org) (Wolf-Chase, Hinman, and Trouille 2021). This website is maintained by the Reimagining Equity and Values in Informal STEM Education Center funded by the U.S. National Science Foundation Advancing Informal STEM Learning program. The evaluation report contains a thorough description of the methods, limitations, findings, and recommendations of the initiative, as well as appendices listing all the organizations to which the initiative was communicated, online surveys used for evaluation, and sample responses to open-ended survey questions. Highlights of the results are presented here. The reader is referred to the full report for further details.

Engaging was evaluated using online surveys designed to be completed by individuals before and after participating in Zooniverse, focus groups conducted by Engaging's leader during the summer of 2021, and feedback gathered via informal conversations throughout the funded period. Information was obtained in order to assess views on science and scientists; gauge interest among faith leaders and communities in participating in citizen science; gather information on the types of projects and messaging that would appeal to different audiences and motivate continuing engagement; and obtain feedback regarding what worked and what did not in integrating Zooniverse into programs of religious organizations.

## **Online Surveys**

Because the faith communities that participated in this initiative were so diverse (seminaries, youth groups, interfaith audiences), surveys were distributed using convenience sampling to different audiences participating in four specific events: attendees of a virtual DoSER Science for Seminaries retreat during the summer of 2020; middle- and high-school youth groups at a Presbyterian church in February 2021; attendees of a virtual international multicultural workshop in March 2021; and attendees of a virtual interfaith environmental webinar in April 2021. As a consequence, most of the feedback provided by the surveys came from one-time events rather than long-term programs. To gather more data from individuals who might not actually participate in a citizen-science project after completing a survey, the surveys were also distributed through the e-newsletter of the Clergy Letter Project (n.d.b.). The Clergy Letter Project



e-newsletter is distributed to between 8,000 and 10,000 religious leaders on a monthly basis. Beginning in February 2021, it was also possible to access the surveys through the initiative's website (American Association for the Advancement of Science Dialogue on Science, Ethics, and Religion 2021).

The rate of survey return was unfortunately low. While 185 people returned the pre-participation survey, only twenty-seven returned the post-participation survey, with an overlap of eighteen people who completed both surveys. The returnee demographic was dominated by white (86%), male (67%), highly educated (87% masters or doctorate), older adults (74% over 50 years of age), who self-identified across diverse faith traditions. The most interesting results came from the open-ended responses, which revealed several common themes. Open-ended questions addressed the inclination of respondents to participate in either online or in-person citizen science; confidence in science and scientists; and whether respondents viewed science to be in conflict with their religious beliefs. For the last, it should be noted that most of the Christian respondents came from mainline Protestant and Catholic traditions and their responses do not necessarily reflect the views of individuals who identify as evangelical Christians.

On the whole, respondents showed no strong preference between participating in online versus in-person citizen science. For each of these types of project, roughly 33% of people who submitted pre-participation surveys were “in between” as to whether they would be inclined to participate, with roughly 33% “likely” or “very likely” to participate and 33% “unlikely” or “very unlikely” to participate. In contrast, 74% of respondents who participated in Zooniverse and returned a post-participation survey were “likely” or “very likely” to participate again. Post-participation respondents were also somewhat more favorably inclined to try an in-person citizen-science project than pre-participation respondents. The most common reason given for not being inclined to participate was time—given the large number of responses from clergy, this may be motivated by reluctance to take on an activity completely outside of one's vocational training.

While most respondents viewed science itself favorably, confidence in actual scientists was tempered by the fallibility and motivations of humans in general. Respondents who knew scientists personally were inclined to view scientists favorably in general, underscoring the importance of having interactive experiences with actual scientists. Some responses indicated a higher level of trust in scientists employed in independent or academic research, as opposed to those employed by corporations or industries that were seen as potentially motivated by economic rather than humanitarian interests.

The vast majority of respondents (90%) did not see conflict between science and their personal religious views, although many of the extended responses came from religious leaders whose theological views may not reflect the

views of their typical congregants. While some viewed science and religion as complementary, others felt that science can inform, challenge, deepen, or modify religious understandings. Still others felt that science and religion could inform each other. Most of the conflict responses were not about science per se but reflected ethical concerns about some applications of science.

Decades ago, Templeton Prize winner Ian Barbour used four terms—Conflict, Independence, Dialogue, and Integration—to describe ways in which science and religion are observed to interact (e.g., Barbour 2000, 2–4). More recently, Lutheran theologian Ted Peters (2019, 26) reported that Berkeley’s Center for Theology and the Natural Sciences adopted the phrase creative mutual interaction (CMI) when formulating the editorial policy of the journal *Theology and Science* in order to promote two-way conversations between science and theology. Peters applies CMI particularly in the context of speculations about the religious and ethical stances of hypothetical extraterrestrial intelligent life, where he suggests that theology can help point out hidden ideologies in extra-scientific claims (e.g., Peters 2019, 25–43). The “complementary” views of survey respondents roughly align with Barbour’s “independence” or “dialogue” categories and the “inform” and “modify” responses with Barbour’s “integration” category (Barbour 2000, 2–4); CMI provides a good description of the views of respondents who felt science and religion could inform each other.

### ***Focus Groups and Informal Conversations***

Throughout the duration of Engaging, the initiative’s leader had informal conversations with prospective citizen-science participants. Additionally, the leader conducted two focus groups during the summer of 2021 to gain additional information from people who had participated in at least one Zooniverse project. The focus groups consisted of a retired Lutheran pastor who used Zooniverse as an individual and helped market the platform among science and religion organizations; a professor at a minority-serving seminary who integrated several Zooniverse projects into her seminary classes and intergenerational summer camps in North Carolina; a lay member of a Muslim community in Chicago who is actively involved in marketing citizen science among Muslims; and the pastor of a 600-member Lutheran congregation in a small Texas city who used Zooniverse with his confirmation class.

One of the primary points to emerge from the focus groups and informal conversations was the importance of the continued involvement of scientists in implementing citizen-science projects. While discussion boards are helpful, there is no substitute for personal, real-time interactions between scientists and participants. This is especially important to help new participants build confidence in their abilities to contribute meaningfully and to help them learn

and stay engaged. Some participants also may need more assistance navigating online tools for annotations and classifications.

One focus group participant suggested the formation of “affinity groups” across different churches and community organizations, wherein people from diverse backgrounds would participate in projects of common interest. Another focus group member felt that organizing a challenge with some sort of reward for reaching a specified level of participation could motivate engagement. For example, such rewards might come from community partners donating gift cards or providing other incentives for volunteers.

There is no one-size-fits-all approach when it comes to marketing participatory research to religious communities or the kinds of projects that may be of interest. Although the Muslim focus group participant indicated that connecting science to religious values expressed in the Qur’ān, and highlighting doing science as a way of connecting with God, was important to Muslims, focus group members felt that on the whole, local conditions, age, and other factors not directly related to religious concerns play large roles in motivating people to participate in citizen science. Scientists need to work closely with local leaders to identify the best fits for a given community. Two-way communication is extremely important, and diversity is critical. Participants need to see scientists that remind them of themselves.

## Recommendations

### ***Science-Apprehensive and Underrepresented Audiences***

The level of trust in science and scientists is affected by the representation of one’s own culture within a given scientific community (Odekunle 2020; Thorp 2020). This is true when it comes to gender, culture, ethnicity, and other factors such as religion. Although Engaging facilitated many new connections with diverse faith communities and provided models for integrating online participatory research into assorted programs, further efforts are required to make significant inroads into populations underrepresented in science. This includes ethnic minorities as well as religious communities that may be more apprehensive about science in general. Many religious communities are happy to work with scientists who may not share their own religious views; however, informal conversations with members of organizations of evangelical Christians in science, including the American Scientific Affiliation (ASA) and BioLogos, indicate this is often not the case when it comes to interacting with more conservative evangelical Christians. These organizations could play important roles in encouraging evangelical Christians to participate in science.

Although Engaging’s leader had several conversations with representatives of the ASA, BioLogos, the Emerging Scholars Network (a network within InterVarsity’s Graduate and Faculty Ministry), and homeschool networks,

the relatively short duration of the funding period, and the fact that all communications were necessarily remote during the pandemic, made relationship building and creating new programs with the help of these organizations unfeasible. However, ASA representatives expressed interest in future possibilities, including a Zooniverse training workshop for ASA chapter members who could subsequently connect with local leaders of evangelical congregations to discuss projects of interest and programming possibilities.

Just as evangelical Christians in science can facilitate building relationships with many Christian communities, minority scientists who belong to religious communities have a critical role to play in building bridges of trust to enhance ethnic and religious diversity in science. Research indicates that scientists need to incorporate discussions about religion to help address race and gender disparities in science, as perceptions of science as anti-faith disproportionately exclude minorities and women (e.g., Bolger and Ecklund 2022; Barnes and Brownell 2018; Ecklund et al. 2019). Religious leaders who serve minority populations might help identify scientists within their communities who could serve as role models for church youth, and a proactive outreach effort by scientists, such as leaders of Zooniverse project teams, to historically Black colleges and universities, educational institutions that serve Indigenous populations, community colleges, etc., would help to build trust and engage audiences that remain severely underrepresented in science.

### ***Creating Long-Term Partnerships***

Building relationships and trust between scientists and faith communities takes time, effort, and resources. Although participatory science offers a natural way to build relationships while at the same time furthering research in many areas, sustainable partnerships require ongoing financial support, and many potential community partners do not have access to the grant-managing institutions that are typically eligible for funding from federal agencies and foundations. One recent effort to engage people from faith communities in participatory science is a partnership between SciStarter and the North Carolina Council of Churches (North Carolina Council of Churches 2024). However, it is likely that engaging many underrepresented audiences will require a more proactive effort, and it is not clear how smaller or poorer communities that do not have access to many resources can “prime the pump.” Funding agencies should consider ways to broaden the categories of organizations that can apply for grants, particularly seed funding that could help small communities establish new programs.

One intent of the Engaging initiative that was never realized was the co-creation of new research projects with faith communities using Zooniverse’s project-builder tool. In principle, any digitized dataset can be turned into a crowd-sourced research project, the scale of which would depend upon the

size of the dataset and the requirements of the project. The dataset might be drawn from a library, museum, historic records of a faith community, etc., to create a project that would address specific research questions of interest to the community or communities involved. Such an effort could directly involve the faith community in the creation of a research project and provide tangible benefits to the community along with the opportunity to broaden their understanding of, and engagement with, science. A few examples of excellent projects that demonstrate some of these possibilities include Print Dynamic Networks (Zooniverse, n.d.c), Scribes of the Cairo Geniza (Zooniverse, n.d.d), and Maria Edgeworth Letters (Zooniverse, n.d.b).

A key factor in efforts such as these is increasing the involvement of scientists. There are many possible venues for recruiting scientists to work with religious communities in an ongoing fashion. In addition to encouraging scientists leading projects on Zooniverse to connect with these communities, scientists could be recruited from within religious communities themselves as well as through networks such as the scientific consultants to the Clergy Letter Project (n.d.c.), professional scientific societies such as the American Association for the Advancement of Science, or organizations devoted to societal wellbeing and respectful dialogue at the intersections of religion and science, such as the Institute on Religion in an Age of Science.

While there are certainly many organizations that could help create partnerships between scientists and religious leaders/communities, and an overwhelming number of potentially useful resources, the sheer wealth of information poses a particularly large challenge for identifying appropriate potential partners. What is desperately needed is the creation and maintenance of a searchable database that could be used by faith leaders and scientists alike to connect through commonalities, needs, interests, location, etc. Such a database could facilitate the building of relationships, the development of new research projects, and the creation of partnerships that could transform how communities and individuals understand the relationship between science and religion.

## Conclusions

Participatory science offers a natural way to build relationships across diverse communities, while at the same time furthering research in many areas and increasing public understanding of the research process. Engaging Faith-based Communities in Citizen Science through Zooniverse was an initiative to broaden awareness of, and participation in, scientific research among faith communities and interfaith organizations. Despite constraints imposed by the pandemic, a short timeline, and a small number of scientists involved, the initiative produced models for how online Zooniverse research projects could be creatively and



effectively integrated into seminary classes, interfaith programs, and youth and family education, as well as suggestions for future expansion of this effort to engage more underrepresented or science-apprehensive audiences.

One-time events made possible through this initiative have continued to receive views on YouTube (American Association for the Advancement of Science Dialogue on Science, Ethics, and Religion 2021); however, a one-time interaction with a scientist is not likely to result in a sustainable program. The most important points that emerged during evaluation of Engaging were the need for continuing personal involvement by scientists, the need to overcome the limitations of time and resources, and the need for the effective pairing of scientists and community leaders. Going forward, this will be particularly important for one aspect of the initiative that was never realized—co-creating new research projects with faith communities.

There is no one-size-fits-all approach when it comes to marketing or the kinds of research projects that may be of interest to faith communities. Local conditions, age, and other factors not directly related to religious concerns play large roles in motivating interest and participation. Scientists need to work closely with local leaders to identify the best fits for a given community. Ongoing two-way communication is extremely important in helping people who doubt their ability to contribute to a research project develop confidence, and diversity is critical. For science to flourish, it must embrace diversity in gender, culture, ethnicity, and religion, bearing in mind that for many people, having scientific role models who share their faith is important to envisioning themselves as scientists. Finally, there is no quick and easy way to build trust across diverse communities in the polarized climate we find ourselves in today. However, creating partnerships between scientists and religious leaders/communities to work together on projects may be the best approach to bridging societal divisions. Just as participating in activities from within a faith community is the best way to better understand the community and its constituents, participating in science alongside scientists is the best way to better understand science and its practitioners.

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