Christianity as a Concealable Stigmatized Identity (CSI) among Biology Graduate Students

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ABSTRACT

Recent research has begun to explore the experiences of Christian undergraduates and faculty in biology to illuminate reasons for their underrepresentation. In this study, we focused on the experiences of graduate students and explored Christianity as a concealable stigmatized identity (CSI) in the biology community. We constructed interview questions using this CSI framework, which originates in social psychology, to research the experiences of those with stigmatized identities that could be hidden. We analyzed interviews from 33 Christian graduate students who were enrolled in biology programs and found that many Christian graduate students believe the biology community holds strong negative stereotypes against Christians and worry those negative stereotypes will be applied to them as individuals. We found that students conceal their Christian identities to avoid negative stereotypes and reveal their identities to counteract negative stereotypes. Despite these experiences, students recognize their value as boundary spanners between the majority secular scientific community and majority Christian public. Finally, we found that Christian students report that other identities they have, including ethnicity, gender, nationality, and LGBTQ+ identities, can either increase or decrease the relevance of their Christian identities within the biology community.

INTRODUCTION

While approximately 65% of the American public identifies as Christian (Pew Research Center, 2019), only 25% of biologists identify as Christian (Ecklund and Scheitle, 2007; Pew Research Center, 2009), making Christians a severely underrepresented group in biology. Past research with undergraduates and biology faculty suggests that one reason Christians are underrepresented in biology is that there is a stigma against Christians in science, which has made Christians feel unwelcomed in the biology community (Ecklund *et al.*, 2011; Scheitle and Ecklund, 2018; Rios *et al.*, 2015; Barnes and Brownell, 2016; Barnes *et al.*, 2017b, 2020b). However, those in the biology community may not know when someone is Christian, because it is a potentially concealable identity. Social psychologists have developed a theoretical framework for concealable stigmatized identities (CSIs) that can help characterize the experiences of those with stigmatized identities that can be hidden (Quinn, 2006; Quinn and Chaudoir, 2009). In this article, we examine the experiences of Christian graduate students in biology programs using the CSI framework to explore 1) the usefulness of the CSI framework for revealing the challenges of stigmatized groups in biology and 2) whether biology graduate students experience their Christianity as a CSI in the context of academic biology.

BACKGROUND

CSIs

A stigmatized identity is an identity that is devalued in a particular social context and associated with negative stereotypes (Steele *et al.*, 2002; Quinn, 2006;

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Goffman, 2009). Stigmatized identities fall into three general categories: 1) physical characteristics of a person, such as weight, attractiveness, and physical features; 2) perceived moral behaviors of a person, such as drug use and sexual behavior; and 3) community affiliations, such race, ethnicity, and religion. For example, there are often negative stereotypes of racially minoritized individuals, those with mental and physical disabilities, low socioeconomic status individuals, women, overweight individuals, LGBTQ+ individuals, and religious minorities that lead to negative biases (Herek and Capitanio, 1993; Phelan *et al.*, 2000; Oswald, 2007). Each of these identities can fall into multiple categories of stigmatization. For instance, being overweight can be perceived as stigma about physical appearance and/or moral behavior (Paul and Townsend, 1995; Puhl and Brownell, 2006). Stigma has a wide array of negative effects both personally and professionally (Newheiser and Barreto, 2014; Bry *et al.*, 2017). Holding a stigmatized identity is associated with a lower sense of belonging (Bosson *et al.*, 2012), higher anxiety (Bosson *et al.*, 2004), lower well-being (Bockting *et al.*, 2013), and poorer health outcomes (Chaudoir and Quinn, 2016). Stigma against these groups has been argued to result in their underrepresentation in high-status roles in society (National Science Foundation and National Center for Science and Engineering Statistics, 2019).

Some stigmatized identities are less apparent than other stigmatized identities, and researchers in social psychology have called these concealable stigmatized identities, or CSIs (Quinn and Chaudoir, 2009; Chaudoir and Quinn, 2010). For instance, while one's racial/ethnic identity and gender identity are often apparent in social interactions,[1] a person with a CSI must reveal their identity for it to become apparent. Although this can be revealed by someone else, many times the individual with the CSI has the decision of when, where, how, and with whom to share the stigmatized identity, which makes the experience of a CSI different from other stigmatized identities (Quinn, 2006).

The ability to control whether others know about a stigmatized identity may be seen as advantageous, because one can potentially avoid the negative biases associated with their stigmatized identity (Quinn, 2006), but having this control also comes at a psychological cost (Newheiser and Barreto, 2014; Newheiser *et al.*, 2017). The decision whether to conceal or reveal the identity to a new person can be difficult—one has to decide whether the person they are revealing their identity to will react negatively, whether it is an appropriate environment or time in the relationship to reveal the identity, and whether there is a way to reveal the identity to avoid negative perceptions. If one waits too long to reveal a seemingly substantial aspect of their identity, it can cause others to perceive them as inauthentic and less likable (Quinn, 2006; Lynch and Rodell, 2018). A person must consider the consequences of making the wrong decision to reveal their identity. Revealing a CSI to a person who is unaccepting can have negative psychological impacts that can cause hesitation to share the identity with others in the future (Kelly and McKillop, 1996; Chaudoir and Quinn, 2010). Further, revealing a stigmatized identity to the wrong person, at the wrong time, or in the wrong way may lead to ostracism (Lynch and Rodell, 2018). However, when someone conceals a CSI to avoid negative stereotypes, it can lower their sense of belonging in the environment (Newheiser and Barreto, 2014; Newheiser *et al.*, 2017). Concealing and revealing a stigmatized identity can be a way individuals try to avoid the negative stereotypes of their identities; these approaches have been called impression management strategies (Lynch and Rodell, 2018).

Those with stigmatized identities may use impression management strategies to control how others perceive their stigmatized identities. In addition to, or in place of concealing, one may also engage in self-group distancing (Derks *et al.*, 2015). Individuals self-group distance by outwardly dis-identifying with the negative stereotypes of the stigmatized group (for instance, members of the LGBTQ+ community refusing to participate in AIDS awareness functions because of the negative connotation of all gay individuals having AIDS). Individuals may also attempt to assimilate by aligning themselves more closely with a positively perceived in-group (e.g., a Black man walking down the street whistling Vivaldi to align himself with a more affluent identity; Steele *et al.*, 2002, Steele, 2011; Lynch and Rodell, 2018). Individuals may also choose to integrate into a positively perceived in-group by highlighting the positive characteristics of the stigmatized identity (e.g., a person from low socioeconomic background emphasizing that they are frugal with resources; Lynch and Rodell, 2018).

The negative psychological outcomes associated with holding a stigmatized identity are dependent on several factors, including 1) centrality, or how central the identity is to the self (Quinn *et al.*, 2014); 2) cultural stigma, or how much stigma actually exists within the community about the identity (Quinn *et al.*, 2014); 3) anticipated stigma, or how much one worries about the stigma affecting them individually (Quinn *et al.*, 2014); 4) experienced stigma, or the severity/frequency of first-hand experiences of stigma; 5) salience, or the different contexts that increase or decrease the importance of the identity in one's mind (Quinn and Chaudoir, 2009); and 6) how "out" one is to others, or the extent to which they must actively conceal their identity (Quinn and Chaudoir, 2009). Thus, the negative effects of having a CSI are often related to the severity of stigma within the environment and how much the individual actually sees that stigma as relevant to their own experience.

Given that revealing a CSI can be high risk, exploring how individuals socially manage concealable identities may be useful. If an individual experiences their identity as stigmatized, past CSI literature suggests they will worry about potential consequences of revealing their identity (Quinn and Chaudoir, 2009; Quinn *et al.*, 2014), conceal their identity (Newheiser and Barreto, 2014), and/or attempt to socially manage impressions of the identity when they do reveal (Chaudoir and Fisher, 2010; Bry *et al.*, 2017). Indeed, the more someone actively conceals their identity, the worse their psychological well-being and other health outcomes become (Jones and King, 2014; Newheiser and Barreto, 2014), likely because concealment is an indication of the presence of stigma in the environment.

Christianity as a CSI in Biology

To explore the potential usefulness of the CSI framework in the unique context of biology, we used the CSI framework to explore Christianity, an identity that is not typically stigmatized

[1]Some individuals have racial/ethnic identities that are hidden, and one should not assume a person's race/ethnicity based on physical appearance alone. Further, the gender identity that one identifies as may not be apparent from their physical appearance; this is particularly important for individuals who identify as nonbinary gender or transgender (Cooper *et al.*, 2020a).

in the general public in the United States but is often stigmatized within the biology community. A recent study from of our research group used the CSI framework to analyze interviews with undergraduate researchers in biology with depression (Cooper *et al.*, 2020b). However, mental illness is highly stigmatized in an array of environments, including among the general public, whereas Christianity may be somewhat uniquely stigmatized in academic biology compared with other environments (Ecklund and Scheitle, 2007). Despite Christians' majority status in broader society, there is increasing evidence that Christians in academic biology are stigmatized, specifically those that biologists characterize as "evangelical" and/or "fundamentalist"[2] (Ecklund *et al.*, 2011; Rios *et al.*, 2015; Barnes *et al.*, 2017b, 2020b; Scheitle and Ecklund, 2018; Henning *et al.*, 2019). We recently conducted an experimental audit study that showed that biology faculty rate an evangelical Christian graduate school applicant as less hirable, less competent, and less likable than an identical applicant who does not signal an evangelical identity (Barnes *et al.*, 2020b). Further, biologists themselves report that they have negative attitudes toward evangelical and fundamentalist Christian religions (Ecklund *et al.*, 2011). Undergraduate Christian students perceive that Christians are seen as less competent in science, and these students even experience stereotype threat based on their Christian identities on assessments they think are measuring their science ability (Rios *et al.*, 2015). In addition to evangelical Christians perceiving a bias against Christians, the majority of Christian undergraduate biology students who are not fundamentalist or evangelical think that discrimination against Christians is a problem in science (Barnes *et al.*, 2020b). In interviews, undergraduate Christian biology majors from a wide range of Christian denominations said that they think their Christianity is perceived negatively in the biology community and that some biology professors are hostile toward religion (Barnes *et al.*, 2017b). Further, almost half of Protestant biologists say that they have been discriminated against in the workplace because of their religion (Scheitle and Ecklund, 2018). In interviews done with Christian faculty teaching evolution, they highlight some of the challenges and negative experiences that they experienced when they were students interacting with secular instructors (Barnes and Brownell, 2018). These findings collectively demonstrate that Christians perceive negative biases against them within the context of science and, more specifically, biology. We posit that Christianity operates as a CSI in biology, even though it does not operate as a CSI in other contexts, such as the broader American culture.

One unique cultural characteristic of academic biology is an emphasis on secular values, whereas in the general public there is a pervasive, and often extreme, bias against secularism and atheism (Gervais *et al.*, 2011, 2017). For instance, a recent study our of our research group found that half of undergraduate biology students believe that one has to be an atheist in order to fully accept evolution according to science (Barnes *et al.*, 2020a). Both religious and nonreligious students perceive that there is a conflict between religious beliefs and evolution (Barnes *et al.*, 2017a), which contributes to the often-held belief in scientific communities that religion is at odds with science. Interviews with secular evolution instructors highlight that some of the individuals teaching evolution hold this conception that one has to choose between being a Christian or accepting evolution (Barnes and Brownell, 2016). Biology is a discipline that may attract atheist individuals for a variety of reasons, one of which may be that it is an environment they feel aligns with their values. However, this could create an environment for Christian students in which they perceive their Christianity is incompatible with the culture of biology.

Undergraduates, graduate students, and faculty members who are Christian can choose the extent to which they share their Christian identities within the biology community. Although display Christian motifs such as crosses that could advertise their religious identity, Christianity often does not require one to wear any clothing or symbols that would identify a Christian's religious affiliation or commitment. Key identifying behaviors of some practicing Christians, such as prayer, church attendance, and adherence to biblical teachings, all can occur separately from one's involvement in the biology community. Further, the fact that Christianity is an inconspicuous identity also means that Christian students may be more aware of hurtful conversations about their identities because comments can be made without others knowing a Christian person is present. Thus, what may compound this stigma against Christianity in biology is that Christianity operates as a concealable identity, so individuals may not even know if they are inadvertently offending someone who is a Christian. Christians can be covert participants in the biology community, which allows them to gather information about biases against them and modify their own behavior accordingly. However, those who hold biases against Christians may not be privy to information about these identities, which hinders them from modifying their own behaviors.

Study Justification

Christians are underrepresented in academic biology. Although Christians make up the majority of the American public, only a minority of Christians become academic biologists (Ecklund and Scheitle, 2007; Pew Research Center, 2009). Currently, biology education researchers who study underrepresented groups often focus on racial/ethnic identity (Eddy *et al.*, 2015; Jordt *et al.*, 2017; Cooper *et al.*, 2018b; Metzger *et al.*, 2018; Rodriguez *et al.*, 2018; Sbeglia and Nehm, 2018; Estrada *et al.*, 2019; Meaders *et al.*, 2019; Theobald *et al.*, 2020), gender identity (Eddy *et al.*, 2014; Eddy and Brownell, 2016; Freeman *et al.*, 2017; Cooper *et al.*, 2018a, 2018; Harris *et al.*, 2019), and generation status/income (Dika and D'Amico, 2016; Jordt *et al.*, 2017; Theobald *et al.*, 2020; Wright *et al.*, 2016). However, Christian students make up approximately half of undergraduate biology students nationwide (Barnes *et al.*, 2020a), and are severely underrepresented in faculty positions in academic biology, but are rarely studied in biology education (for an exception, see Henning *et al.*, 2019). Little research exists to document whether stigmas related to religiosity contribute to attrition of Christians and at what stage of training. Further, there is emerging research

[2]When interviewed about their perspectives on religion, scientists tend to describe "fundamentalism" and/or "evangelicalism" as a religion that is rigid and unchanging in the light of new information, based on moral command rather than moral principle, has a uniform belief structure that discourages diversity of viewpoints, and often tries to intrude on the domain of science (Ecklund *et al.*, 2011). Most scholars of religion would consider "fundamentalism" and "evangelicalism" distinct groups, even though scientists themselves tend to use these terms interchangeably (Ecklund *et al.*, 2011).

that indicates that the higher rates of Christianity among Black and Hispanic students may be important to consider for why they have been minoritized in academic biology (Barnes *et al.*, 2020b; Mead *et al.*, 2015; Salazar *et al.*, 2019; O'Brien *et al.*, 2020). This means that not only are we potentially losing an opportunity to include Christians in academic biology, but potentially the stigma against Christianity may extend disproportionately to Black and Hispanic students.

A graduate degree is an essential step toward becoming a biologist, but there is little research on this population of Christian biologists. Graduate school is an important time for the process of socialization into academia (Brownell and Tanner, 2012; Austin, 2002) and is a particularly sensitive time if you have a minority identity within a discipline (Gardner, 2008). Negative experiences have been documented among Christians learning biology in high school (Bertka *et al.*, 2019), completing undergraduate degrees in biology (Winslow *et al.*, 2011; Barnes *et al.*, 2017b), and working as faculty in biology departments (Barnes and Brownell, 2018; Scheitle and Ecklund, 2018), yet we know of no study done with Christian graduate students. Thus, we explored the following research questions among graduate students in biology using concepts from the CSI framework:

- In what ways, if any, do Christian graduate students perceive cultural stigma, anticipate stigma, or experience stigma?
- How do Christian graduate students decide whether to reveal or conceal their identities?
- In what ways, if any, do Christian graduate students use identity impression management strategies in the biology community to avoid negative stigma about their identities?
- How does centrality and salience of the Christian identity matter for graduate students' experiences of stigma in the biology community?

METHODS

Arizona State University's Institutional Review Board approved this study (protocol no. 00010113).

We recruited a national population of Christian graduate students for interviews. In spring 2019, a recruitment message was sent to biology graduate students at one research-intensive university in the Southwest. The recruitment email asked students to volunteer for an interview about their experiences as a Christian student in biology in exchange for a $15 gift card. In the Fall of 2019, we recruited from additional institutions by having messages sent out through university Listservs for biology graduate programs at 63 R1 public and private institutions across the United States. Graduate students completed a survey that collected their demographic information, their views on evolution, and whether they would be willing to participate in an interview about their experiences in graduate school. We screened for Christian students who accepted evolution, emailed them to request an interview, and conducted interviews with these students until data saturation was reached (no new themes were emerging from interviews). We chose to screen for Christian students who accepted evolution, as we did not want to explore a creationist identity, which would pose unique challenges in the biology community distinct from a Christian identity, given that view would be in conflict with evolution. In total, 33 graduate students (30 PhD and three MS students) from 16 R1 public universities were interviewed about their experiences as a Christian student in a biology graduate program. Students were in a variety of biology graduate programs, including, but not limited to, microbiology, botany, evolution, genetics, neuroscience, ecology, and animal behavior.

Surveys

We gathered additional survey data from students before the interview to document student religiosity and the extent to which they experienced conflict between their Christian and science identities during middle school, high school, undergraduate school, and graduate school. We asked students to report how long they had been in their biology graduate programs and to list all of their prior degrees to ensure that each student had participated in at least one full semester as a graduate student before the interview. To characterize students' religiosity, we asked students to report their current religious affiliations, the extent to which they considered themselves religious on a 10-point scale, how often they currently attend church (never, sometimes—less than once per month, regularly—more than once per month, or most weeks/every week), and how often they currently pray (never, sometimes—less than once per month, regularly—more than once per month, or most weeks/every week). Because prior research indicates Christian students may be more politically conservative and less likely to pursue academic careers in science (Scheitle and Ecklund, 2017), we also asked students to report the extent to which they considered themselves a science person (not at all to extremely, 10-point scale), to report their political leanings (very liberal to very conservative, seven-point scale), and to report their career goals in an open-ended question.

We used a previously published instrument to identify students' views on evolution and religion (Yasri and Mancy, 2016; Barnes *et al.*, 2020a), so we knew that the students who we were interviewing accepted evolution. For the purposes of this study, we define acceptance of evolution as accepting that all life on Earth (including humans) developed from previous species, so we did not include any student who answered any special creationist option.

Finally, we collected students' demographic information (gender, race/ethnicity, LGBTQ+ affiliation, parental education level, and caregiver status) as part of a standard demographic form to provide demographic information for readers about the variation in our data set. All of the questions used to gather these data can be found in the Supplemental Material. The aggregated demographics of the 33 students interviewed are in Table 1. Variation in individual students' religious denominations, religious identity strength on a scale of 1–10, frequency of church attendance, and beliefs about evolution can be found in Table 2. All names are pseudonyms to protect student identity.

Interviews

We developed the interview script to explore Christian graduate student experiences in biology through the lens of CSIs (Quinn and Chaudoir, 2009; Chaudoir and Quinn, 2010; Quinn *et al.*, 2014) to reveal potential ways to improve the experiences of these students. Therefore, we created the questions primarily from concepts derived from the CSI framework: "cultural stigma" (i.e., "Within the culture of biology, how do you think people see Christians?"), "anticipated stigma" (i.e., "If you were to tell someone in the biology community that you are a Christian, would

TABLE 1. Combined demographics of students in this study

Student demographics	Interview participants $n = 33$ n(%)	Student demographics	Interview participants $n = 33$ n(%)	Student demographics	Interview participants $n = 33$ n(%)
Gender		Religion		LGBTQ±	
Female	27 (82%)	Catholic	8 (24%)	Yes	7 (21%)
Male	5 (15%)	LDS[a]	4 (12%)	No	25 (76%)
Nonbinary	1 (3%)	Episcopalian	1 (3%)	Decline to state	1 (3%)
Race/ethnicity		Evangelical	1 (3%)	Parental educational level	
White	26 (79%)	Greek Orthodox	1 (3%)	First generation	9 (27%)
Latinx	4 (12%)	Lutheran	2 (6%)	Bachelor's	9 (27%)
Latinx/White	1 (3%)	Methodist	4 (12%)	Master's or above	15 (45%)
Asian	1 (3%)	Nondenominational	3 (9%)	Politics	
Asian – Indian	1 (3%)	Presbyterian	2 (6%)	Liberal	21 (64%)
Evolution acceptance		Protestant (did not specify further)	3 (9%)	Moderate	8 (24%)
Atheistic	3 (9%)	Roman Catholic	2 (6%)	Conservative	4 (12%)
Agnostic	10 (30%)	Russian Orthodox	1 (3%)		
Deistic	6 (18%)	United Church of Christ	1 (3%)		
Theistic	13 (39%)				
Interventionist	1 (3%)				

[a]This group represents those affiliated with the Church of Jesus Christian of Latter-day Saints who prefer to be named as such as opposed to the term "Mormon".

you worry about what they would think about you? Why or why not?"), "experienced stigma" (i.e., "Can you describe a time, if any, when someone in the biology community made you feel like they did not value your religion?), "salience" (i.e., "Can you tell me about a time, if any, when you were interacting with scientists and you were reminded of your Christian identity?), "outness" (i.e., "To what extent do people in the biology community know that you are Christian?"), "revealing" and "concealing" (i.e., "Can you tell me about instances when you have revealed that you are Christian to someone in the biology community?" and "Can you tell me about instances in the biology community when you have had the chance to reveal that you are a Christian, but decided not to?"), and "impression management strategies" (i.e., "Are there particular ways you talk about your Christian identity in the biology community to avoid negative perceptions?"). A copy of the final interview script is provided in the Supplemental Material. The interviews were audio-recorded and were approximately 45 minutes long. All interviews were conducted by a single researcher to ensure consistency across interviews (M.E.B.).

Interview Analysis

Interviews were analyzed using a combination of deductive and inductive content analysis (Krippendorff, 2012; Cho and Lee, 2014) with constant comparison methods (Glaser and Strauss, 1967; Glesne and Peshkin, 1992). We used deductive coding to identify relevant student experiences within the CSI framework; interviews were coded for students' perceptions of cultural stigma, anticipated stigma, and instances of experienced stigma; we coded for contexts that are salient to students' Christian identity, the outness of students about their Christianity, instances of students revealing and/or concealing their Christian identities, and any impression management strategies students used to minimize negative perceptions of their Christianity. Inductive procedures were then used to identify subthemes emerging within these categories of experiences.

Specifically, directly after each interview, M.E.B. took notes identifying preliminary themes. After the first 14 interviews were completed, each interview was transcribed and read independently by two researchers (M.E.B. and S.A.M.). Pseudonyms were given to participants to protect their identities. The researchers each read two to three interviews independently, took detailed independent notes and then met to compare the themes each researcher identified. The researchers continued to meet after each group of interviews were analyzed until 14 interviews had been read and the two researchers had agreed on a set of themes in the data. The researchers used constant comparison methods to categorize quotes into each theme and ensure that each quote matched the theme description (Glaser and Strauss, 1967; Glesne and Peshkin, 1992). In cases in which quotes were too dissimilar, a new theme was created, and the quote was categorized within the new theme. The researchers then created a preliminary coding rubric, and one researcher (M.E.B.) coded the first 14 interviews with this rubric. For the next 13 interviews, the researchers used the newly established rubric to code the interviews independently and compare their codes for each interview; if the researchers had different codes, they discussed the data and came to agreement about what the code should be. During this process, the two researchers also identified new themes emerging from the data and added them to the coding rubric. Once data saturation was reached (no new themes were emerging; Guest *et al.*, 2006) and the coding rubric was finalized, the researchers independently coded six interviews and compared their coding; the Cohen's κ interrater score was high (0.83) and at an acceptable level (Landis and Koch, 1977). One researcher (S.A.M.) then reviewed all past interviews to code for themes that were not in the rubric when that interview was originally analyzed.

We do not report the frequency of each theme across transcripts, because the frequency of a theme will not necessarily indicate its prevalence among a broader population of Christian

TABLE 2. Variation in students' religious denomination, religious identity strength on a scale of 1–10, frequency of church attendance, prayer frequency, beliefs about evolution, and state of current residence[a]

	Denomination	Religious identity strength	Church attendance	Prayer frequency	Evolution acceptance	State of residence
Jiu	Protestant	9	Every week	Two to four times/week	Theistic	Pennsylvania
Hayley	Church of Christ	5	< Once/month	One to two times/week	Agnostic	Montana
Rhonda	Nondenominational	5	< Once/month	One to two times/week	Theistic	North Dakota
Gina	Catholic	6	< Once/month	One to two times/week	Agnostic	Florida
Becky	Protestant	7	< Once/month	One to two times/week	Theistic	Indiana
William	Methodist	8	< Once/month	< Once/week	Theistic	Arizona
Teresa	Greek Orthodox	5	< Once/month	< Once/week	Agnostic	California
Alyssa	Catholic	7	< Once/month	< Once/week	Deistic	Arizona
Sean	LDS	10	Every week	> Four times/week	Theistic	Arizona
Keya	Catholic	7	Every week	One to two times/week	Agnostic	Florida
Mara	Presbyterian	7	Every week	One to two times/week	Agnostic	Arizona
Bella	Lutheran	6	Never	< Once/week	Theistic	North Dakota
Susan	Catholic	3	Never	< Once/week	Agnostic	Arizona
Nanette	Catholic	5	< Once/month	< Once/week	Theistic	North Carolina
Jody	Nondenominational	2	< Once/month	< Once/week	Agnostic	North Dakota
Eliza	Presbyterian	2	< Once/month	< Once/week	Agnostic	Illinois
Lauren	Catholic	6	< Once/month	< Once/week	Atheistic	New Jersey
Victoria	Lutheran	7	Every week	> Four times/week	Deistic	North Dakota
Barbara	Evangelical	10	Every week	> Four times/week	Theistic	Oregon
Janelle	Roman Catholic	6	Never	> Four times/week	Atheistic	Florida
Ananya	Roman Catholic	3	< Once/month	Never	Atheistic	Florida
Amanda	Methodist	6	Every week	< Once/week	Intervention	North Carolina
Deena	Nondenominational	3	Never	< Once/week	Deistic	North Carolina
Brittany	Episcopalian	3	> Once/month	< Once/week	Agnostic	California
Rose	Catholic	7	< Once/month	< Once/week	Agnostic	Arizona
Gabriele	Catholic	4	< Once/month	< Once/week	Deistic	Arizona
Ciara	Russian Orthodox	5	< Once/month	< Once/week	Deistic	Illinois
Derek	LDS	8	Every week	> Four times/week	Theistic	Arizona
Sally	LDS	8	Every week	> Four times/week	Theistic	Utah
James	Evangelical	9	Every week	Two to four times/week	Theistic	Arizona
Hope	Methodist	8	> Once/month	One to two times/week	Deistic	North Carolina
Thomas	Methodist	7	Every week	< Once/week	Theistic	Arizona
Melissa	LDS	6	Never	< Once/week	Theistic	Arizona

[a]All names are pseudonyms to protect student identity.

graduate students (Glesne and Peshkin, 1992; Maxwell, 2010). Our study design and data analyses were qualitative in nature and aimed at describing the landscape of experiences that exist among students rather than quantifying the prevalence of those experiences. However, because we interviewed 33 students, which is broaching a sample size needed to be able to start to generalize findings, we do indicate when "most" students (two-thirds or more), "many" students (between one-third and two-thirds), or "some" students (less than one-third) reported on a theme. We only included themes in our final coding rubric that were reported by at least five students. The final coding rubric can be found in the Supplemental Material. Quotes have been lightly edited for clarity and to protect any potentially identifying information about the students or their institution.

RESULTS

In total, the researchers found 52 themes in the data that were each reported by at least five students. Nine themes were deductively derived from the CSI framework (centrality, perceptions of culture stigma, anticipated stigma, experiences of stigma, revealing, concealing, impression management strategies, salience, and outness). We inductively identified 43 subthemes within these larger themes. In the following sections, we present our findings on the diversity of experiences and perceptions that Christian graduate students reported when probed about how their Christian identities may operate as a CSI in biology. All themes that emerged from the data and the coding rubric used to analyze the data can be found in the supplemental material.

Finding 1: Christians Perceive, Anticipate, and Experience Stigma in the Biology Community

Types of Stigma: Cultural, Anticipated, and Experienced. Researchers who use the CSI framework typically describe three related but distinct concepts of stigma that determine whether someone will experience psychological distress based on their identity (Quinn and Chaudoir, 2009; Quinn and Earnshaw, 2011). The amount of actual stigma in the environment (cultural stigma), the extent to which a person worries about the stigma (anticipated stigma), and the frequency and intensity with which a person experiences the stigma

(experienced stigma) (Quinn and Chaudoir, 2009) are all different constructs of stigma. A person can have incongruent perceptions of stigmas. For instance, a person who anticipates stigma might not necessarily actually experience that stigma. Alternatively, a person may experience stigma, but not anticipate or worry about that stigma because of a positive self-perception of their identity (Frable *et al.*, 1997). An individual could also perceive a cultural stigma against their identity and yet not experience that stigma, because they choose to conceal that identity. Therefore, we describe findings from each of these stigma categories separately.

Perceptions of Cultural Stigma against Christians in Biology. Although many students recognized that there is variation in how people within the biology community perceive Christians, most students perceived that the biology community broadly has negative attitudes toward Christians. This is consistent with interviews conducted with undergraduate students (Barnes *et al.*, 2017b). Many students said that the culture of biology tends to stereotype Christians as unintelligent. For example, Sean said, "Unfortunately (…) in the culture of biology, most people look at Christians as idiots." Many students also said that Christians are often stereotyped as extremists within the culture of biology. Further, they indicated that Christians are assumed to be socially conservative (anti-LGBTQ+, anti-abortion, and anti-feminism) and have anti-science attitudes (anti-evolution, anti–climate change, and anti–stem cell research). For instance, Teresa said, "I think there's definitely a stereotype about a Christian who doesn't believe in evolution, thinks that the earth is 4,000 years old, doesn't listen to scientific evidence, and is hateful and bigoted." Many students also described a negative stereotype in the biology community that Christianity is incompatible with science. Rhonda reported, "[People in the biology community] make an assumption that you have to be one or the other, a scientist or a Christian." James illustrated the multifaceted ways that biologists negatively see Christians:

> I think there are several tropes of how people [in the biology community] see Christians. Some see Christians as … poor critical thinkers, that they don't take evidence and facts seriously, or that they are weak-willed people who need some sort of moral spiritual crutch. … I would even say that's the most common perception … I would say that the most hostile reactions towards Christians apply to Protestants and Evangelicals in particular.

James's comments are in line with prior research with scientists that showed a variation in scientists' perceptions of religion and a large group of scientists who say that they only have negative attitudes toward evangelical or fundamentalist types of religion (Ecklund *et al.*, 2011; Barnes *et al.*, 2020b). But many students noted that they perceive that the tendency within the biology community is to lump all Christians in with this negative stereotype of evangelicals and fundamentalists.

Anticipated Stigma about Christian Identity in Biology. Most students we interviewed indicated that if they were to reveal their own Christian identity to those in the biology community, they would worry about negative perceptions from their peers, colleagues, mentors, and/or instructors. Most often students were worried about being perceived personally by other biologists as the negative stereotypes they believe exist within the biology community. They were concerned that they personally would be "lumped in" with these extreme stereotypes of Christians as fundamentalist, evangelical, and socially conservative. Some students were worried they would be perceived as less scientifically capable if they were to reveal their Christian identities. For instance, Bella reported experiencing a high level of conflict with her Christian identity in graduate school and said, "I think I'd worry that [those in the biology community] would view my science as being faulty because of my faith."

Many students described being particularly worried in contexts in which they were lower on the professional or social hierarchy. For instance, Amanda described worrying about what more senior graduate students would think about her Christian identity:

> There have been times when senior grad students would be kind of insulting people who were religious and being like …, "I don't know how anybody could believe all of this" or saying things like, "All of these people who are Christians are bad people." … I didn't say anything because I didn't want to have to argue my side. Especially with somebody who is older and has been around longer in the program.

Other students reported being particularly worried about the views of faculty who give the impression that they think "all religious people are closed-minded or oppressive in some way," and students like Nanette talked about how these negative stereotypes can be more detrimental coming from those in higher-level positions:

> I think telling my advisors is where I start getting a bit squirrelly about talking about that I'm Christian. Because they're in a position of authority and their influence matters a lot … and if they're one of these people who is very anti-religious, that might bias them against me and that would be detrimental to my career. When it's a peer, the potential negative consequences aren't very high, but when it's your advisor, the potential negative consequences are much higher.

Given how a research advisor's impression of a student can influence the time they spend mentoring the student and the quality of their letter of recommendation (Limeri *et al.*, 2019), this is likely to create stress for Christian students.

Experienced Stigma about Christian Identity. In addition to perceiving that there is a negative stigma against Christians in biology and anticipating stigma about their Christian identities if they were to reveal it, many participants also described actually experiencing stigma against Christians in biology. Many participants described experiencing this stigma in the form of negative remarks or jokes about Christians. For instance, Deena noted that in her first year of her PhD program, a faculty member sent an email out to everyone in the department that was not respectful of students with a religious identity. She said,

> An email came out my first year in which someone brought up how microaggressions can affect a work environment. Within a few minutes of that email going out, someone replied about how difficult it was to have an intelligent conversation with people who are Christian and believe in God … It made me

> realize that there are definitely some people in biology who don't … respect having a religious identity.

Additionally, the interviewees described overhearing people who did not know they were Christian make remarks or jokes about Christians. Some students described these instances occurring often, but many said they only happened occasionally, and most were more "subtle" jokes than extreme attacks on Christians. For instance, Thomas said,

> I think in the biology community, people's religion is not brought up very much at all. Assuming some reference to religion is going to be made, though rare in occurrence, there's probably a higher chance that it is a subtle rip than anything else. Maybe a joke or reference to fundamentalists, a "that's funny" kind of thing.

Victoria said that one-on-one interactions are generally respectful but that, in a group setting, one can expect to encounter negative remarks about Christians:

> For the most part those that interact with me who know I'm Christian are very respectful and they try their best to not say anything anti-religious. But if you get into any groups of people you may experience some situations where somebody is going to make a joke about "those silly Christians and their imaginary man in the sky" and how there's such a problem in trying to teach certain things because they are always so resistant.

However, other students like James described more frequent negative remarks:

> I've listened to [people in the biology community] talk about people with faith identities in the third-person sense. They talk like I would talk if I thought no one was there … sometimes a person talks about how those "Bible thumpers" are. … it's very regular. I would say it usually happens from some sort of faculty person a couple times a semester.

In these contexts, the importance of Christianity being concealable is apparent. In many of these situations in which a student describes experiencing stigma against their Christian identity, it is in the presence of someone who may not even know that they are Christian. Thus, the person may be inadvertently less respectful to their identity because they did not realize that anyone had that identity.

Some students described being stereotyped as creationists or more extreme Christians, and many students noted that people in the biology community are surprised to find out that they are Christian, with some assuming that their Christian beliefs are incompatible with science. For instance, Susan said, "A lot of times it is assumed that if you're Christian, you automatically believe that (…) evolution can't work or couldn't happen."

Although most students' experiences of stigma were described as subtle, there were experiences that were more direct and personal. For instance, James had one of the most explicit experiences of stigma in the biology community we heard from participants:

> At a workshop one of my colleagues asked me, "Oh, are you Christian?" I said, "Oh yeah,"… and she pretty bluntly said, "I don't see how you can be a serious academic and also a Christian." I really liked this person but I felt like this pretty immediately soured the relationship … inside I was thinking, "This is uncomfortable and I don't feel great about this." But the actual, out-loud response was, "Well, yeah. I have them both. I like to think that I'm a serious scholar and my Christianity and academics either work in parallel or in different spheres." She just reiterated. She said, "Yeah, I don't know how you can do that." We were more friendly before that but after that we had a strictly professional relationship. It felt like she just didn't want to be as friendly anymore after that.

In summary, we identified that Christian students in biology reported a cultural stigma, anticipated stigma, and experiences of stigma against Christians in biology. Students said they perceived that those in the biology community think Christians are unintelligent, socially conservative, intolerant of other groups, and unaccepting of science. Students often had worries about what people in the biology community would think if they were to reveal their Christian beliefs, and many students described actually experiencing a stigma against Christians, often in the form of jokes or negative remarks about Christians. These experiences confirm that Christianity can be experienced as a CSI in biology. Next, we describe students' experiences revealing and concealing their Christian identities in the biology community.

Finding 2: Christian Biology Students Make Decisions about whether to Conceal or Reveal Their Identities in the Biology Community

Disclosure Decision Making. A CSI is unlike a visible stigmatized identity, in that, at least to some extent, individuals can choose whether to keep their identity hidden or to share it with others. The act of concealing one's identity can be psychologically stressful but revealing one's identity may be psychologically beneficial if the experience revealing it and being transparent about one's identity is positive (Chaudoir and Quinn, 2010). We describe in this section the degree to which students are "out" about their Christian identities in the biology community (outness) and students' experiences concealing and revealing their Christian identities.

Outness. Students described different levels of outness about their Christian identities. Many students said multiple people in the biology community knew they were Christian, but there were also many students who said relatively few people knew about their Christianity. Many students wanted to be open about their Christianity because they want to be themselves, including Victoria, who said, "It's not really something about myself that I want to hide … if I have to interact with these people on a daily basis, I feel like they should know who I am." Many students, such as Hope, also described being open about their Christian identities when it is relevant to the situation or if someone asks them, but that it is not a topic that is discussed often in biology and/or it would seem out of place in most contexts. She said, "If there is someone I'm close to that I want to tell, I will. As far as mentors or other faculty that I just don't talk to very much, I wouldn't bring it up because it would seem out of place."

Many students noted that they do not hide their Christianity but instead are "not outspoken" about it. For instance, Gina

stated, "That's not really something that I volunteer. If someone asks, I have no problem telling, but it's not something that I just flaunt around."

Students often described a general policy of withholding their Christian identities unless someone directly asks them. For instance, Lauren said, "If someone else asks, then I'm happy to share, but as I said, I try to keep that private." However, some students described an active intent to be covert about their Christian identities in the biology community. For instance, Hope did not reveal her Christianity to other biology graduate students for more than 2 years, because "there are so many students that have this animosity towards Christianity."

These results indicate that there is variability in the degree to which others in the biology community know about Christian students' religious identity. Students described being open about their Christianity when it is relevant because they want to be themselves, which aligns with previous literature that suggests that individuals with CSIs have more positive psychological outcomes if they are able to reveal their identities (Chaudoir and Fisher, 2010). However, students also said that many people do not know about their Christian identities, because they chose to actively conceal them or not reveal them, given that it is a taboo topic or because of negative attitudes toward Christians in the biology community. In the following sections, we describe students' more specific experiences of revealing and concealing their religious identity.

Revealing and Concealing. Most students described revealing their Christian identities to at least one person in the biology community, and many students were comfortable revealing that they are Christian when it was relevant to the discussion or if they were directly asked by someone. Many students described feeling comfortable revealing their Christian identities specifically when they know the other person is religious. For instance, Amanda said she was more comfortable revealing her identity to her Jewish professor:

> One of my professors a couple of semesters ago was Jewish and she put (on the syllabus) that we're not going to have class on certain days because she was observing religious holidays. And I felt much more comfortable telling her that I wouldn't be in class one day because it was over Easter.

Some students went so far as to say that they would not reveal their Christianity to another person in the biology community unless they knew that person was also religious. For example, Nannette said, "I would never choose to discuss my faith with anyone in the biology community unless I knew they were also of faith." This increased comfort with revealing religious identity with other religious scientific role models has also been observed in the context of undergraduate education, where religious students' evolution acceptance increased under conditions where they were taught by religious instructors (Barnes and Brownell, 2017; Holt *et al.*, 2018; Lindsay *et al.*, 2019); increasing students' comfort with revealing their own religious identity may be an additional benefit.

When students chose to reveal their identities, they said discussions about church were a common way disclosure was initiated. Many students were like Derek, who said, "If someone asks, 'what did you do over the weekend?,' and I feel like we're more than acquaintances, then I feel comfortable saying, 'I went to church.'"

Some students described wearing clothes and jewelry that indicated a Christian identity, such as a cross necklace, which sometimes prompted people in the biology community to ask about the student's religious identity. Interestingly, these students often described answering the inquiry without actually revealing that they themselves are Christian. Students reported answering inquiries by saying they "grew up going to church" or that "it was a gift from my mom." Some of these students simply thought that revealing their Christian identities would be "unprofessional" and that in the workplace you "just don't talk about religion and you just don't talk about politics," so they choose not to disclose their identities unless they are directly asked.

Many students described becoming more comfortable revealing their Christian identities around people who they are closer to or trust in the biology community. These individuals tended to be people who the student considered a friend or who showed positive interest in the students' religious beliefs. For instance, Janelle described telling those with whom she felt "comfortable" and had "gotten close to" in the biology community, and Melissa talked about only revealing her Christianity "in friend groups, just because I know my friends are people that can have … differing opinions and listen, even if they don't agree." There was a need for an already established relationship or connection before they felt willing to share. This is in direct parallel to the finding that those with CSIs need to establish a personal relationship with someone before revealing their identities (Chaudoir and Quinn, 2010).

Many students described revealing their identities so that they could correct misconceptions or negative stereotypes about Christians within the biology community. For instance, Deena talked about her experience having to correct a negative stereotype about Christians that they all have a conflict with science because they interpret the Bible literally:

> I said, "Extremist Christians who accept the Bible as literal have a conflict with it [science]." Towards the end, I was like, "Look. I am Christian. I just don't associate with a literal interpretation of the Bible," but everyone else in the group associated all Christians as being represented by fundamentalist Christians who take the Bible literally. I had to out myself and that's probably the only time when I've been open about my belief system.

Some students described revealing or concealing their Christian identities on academic applications. For instance, Derek talked about how putting his mission trip on his graduate school application to a public university was a positive experience:

> So, I'm a member of the Church of Jesus Christ of Latter-day Saints and so I served a two-year volunteer service mission for my church. I had that on my résumé when I applied for graduate school and my mentor asked me about it … why it was important to me, what I learned from it and how it's shaped and molded me into who I am today. So, it was a really neat opportunity for her to know my values and beliefs and to have an understanding of more than who I am as a scientist.

However, some students decided not to include their Christian identities on their academic applications, because they

were afraid it might reflect on them negatively. For instance, Sean described intentionally omitting his mission trip and the importance of his religion from his personal statement for the National Science Foundation Graduate Research Fellowship Program (NSF GRFP):

> I was applying for the NSF GRFP … I wrote my narrative, but I left out that I served in the mission for two years in the Caribbean. I left out that church is a really big part of my life, because I just wasn't sure how that would be taken. I wasn't sure if that would be a mark against me.

Sean's worry was not without reason. A study that examined biology faculty attitudes toward an applicant who revealed being an evangelical Christian who went on a mission trip found that faculty were more likely to rate that applicant less desirable for entry into graduate school (Barnes *et al.*, 2020a).

Many students reported instances within the biology community in which they chose not to reveal their Christianity, even though they thought it was relevant or they would have liked to. Many students, including Victoria, described choosing to conceal their identities around people who they perceive as anti-religious:

> We were having a joint lab meeting and a gal in our group … said that a specific area of the US tends to be more religious and also tends to have a lower belief in evolution. And one of the individuals from the other lab said, "Some people need to be pulled out of their redneck Christian origins and brought to a liberal college so they can be taught real information instead of story books." Which was uncomfortable … I didn't want to say anything. A couple of the individuals in my lab that know [I am a Christian] gave me like a look and I said, "It's fine. Just move on."

Many students highlighted that it would be too much emotional and mental labor to reveal their Christianity in these instances, because they would then have to explain their own identity and defend their ability to be a Christian and a scientist. They often said they chose to conceal when they "did not want to deal with" a situation or person that they perceived would be combative toward their identities. For instance, Derek said,

> Someone was talking about how there's no way there could be a God and I just didn't say anything. It seemed like a confrontational discussion and I am not one for confrontation. I am open with my beliefs, but if it's confrontational, I'll avoid it. So when people have been hostile towards someone with Christian beliefs, I tend to not share what I believe in.

Lauren talked about how she chose not to reveal her Christian identity based on what she saw happen to a student who was Muslim:

> We were having lunch and talking about overall religion with some faculty members and graduate students … and one of the students mentioned she was Muslim. One of the faculty members turned against her and said that all Muslims oppress women … So, after that, I decided I won't talk about religion with that specific faculty member or discuss anything like that with him.

In summary, in line with holding a stigmatized identity (Quinn, 2006), these results indicate that Christian students consider whether it is best to reveal or conceal their identities in the biology community. Many students said they reveal their identities when they know they are around "safe" others who are friends or another religious individual or when they feel they need to correct negative stereotypes about Christians. Many students also said they conceal their Christian identities because they perceive an emotional labor that comes with defending their identities to individuals they perceive to be anti-religious or they perceive it as an inappropriate or unprofessional topic to discuss in the biology community.

Finding 3: Christian Students Use Multiple Impression Management Strategies in the Biology Community

Impression Management Strategies to Avoid Stigma. Besides concealing or revealing, individuals with stigmatized identities, concealable or not, may try to reduce the negative perception of their identities in several ways, and stigma researchers call these impression management strategies (Chaudoir and Fisher, 2010; Bry *et al.*, 2017). For instance, African Americans may distance themselves from negative stereotypes of their group by deliberately dressing, talking, or behaving in a way that is in line with white cultural norms (Roberts, 2005). People may also emphasize to others the positive aspects of the stigmatized identity. For instance, a person who is from a low socioeconomic background may successfully argue that they have more experience being efficient and frugal, so growing up with less money taught them useful skills (Roberts, 2005). Therefore, if Christianity is stigmatized in biology, we may expect that students will be using some of these strategies to avoid negative perceptions of their Christianity by other biologists. In the following sections, we describe the impression management strategies that Christian students described using when interacting with people in the biology community.

Self-Group Distancing. Most students described distancing themselves from the negative stereotypes about Christians in the biology community. For instance, most students described themselves as accepting of science or not taking the Bible literally, unlike the negative stereotype of Christians as unaccepting of science. Students particularly emphasized their acceptance of evolution. For instance, Rhonda talked about how she accepts evolution and does not take the Bible literally, "[The Bible is] much more like a story. In stories, timelines aren't specific. So, I'm 100% a scientist at heart and I'm a strong believer in evolution."

Some students described distancing themselves from a stereotype that Christians are politically and socially conservative. For instance, Eliza described how she reveals her Christian identity in the biology community: "I think that I've made it clear that I'm a very liberal Christian and that I'm very accepting of people." Also, James described "signaling" a politically liberal identity by "enumerating certain politics" like "voting for Hillary Clinton" and being "pro-gay marriage" to ward off the stereotypes that make biologists think that he is "hugely problematic" as an evangelical Christian.

Some students went as far as to sympathize with biologists' negative attitudes toward Christians. For instance, Rose talked about how biologists have to combat challenges in science education that come from Christian groups, which causes scientists to have negative attitudes:

> I also think some scientists themselves have been on the wrong side of this sort of hatred (from Christians) … I think that can be very easily internalized and especially when this [evolution] is what you do. I am an evolutionary biologist yet I have had [Christian] relatives who say, "No, that isn't real."

These results indicate that Christian students may distance themselves from the negative stereotypes about Christians by highlighting that they are accepting of science, that they are politically and/or socially liberal, or that they themselves have had negative experiences with Christians. However, in addition to distancing themselves from negative stereotypes, students also emphasized the positive characteristics of being Christian.

Integrating. Students emphasized the positive aspects of their Christianity to avoid negative impressions of their identities and that that their Christian identities could contribute positively to the biology community. Specifically, many students emphasized the value they bring by being able to communicate science to Christian audiences, which comprise approximately three-quarters of the population of the United States (Pew Research Center, 2015). Alyssa talked about how she may be able to help Christian students who are struggling with evolution:

> If there are students that might be averse to learning about evolution … I can relate to them because I know what it's like. I think it would be really helpful because I can be at their level and tell them I've had similar experiences and that I grew up religious but I'm still a scientist.

This result indicates that students may try to emphasize the value they bring to the biology community to avoid negative impressions of their Christian identities.

Separation of Identities. As another way to manage their identities, many students described keeping their Christian identities and science identity separate from one another to avoid potential conflict. Gina described making clear to others that her personal religious beliefs are separate from the science that she conducts. She said:

> I also try to keep religion and science apart. It took a while to get to that point, but that was sort of something I had to gradually figure out on my own … When I do bring it up, I'll say, "Just because this is my personal belief it doesn't get in the way of my science." … So I usually put some sort of modifier like that on to it.

Students also described being reserved with others about their Christian identities so that others in the biology community would not think that they were "proselytizing," "preaching," or trying to "convert" them to Christianity. For instance, Teresa said, "I guess not telling people right off the bat is kind of a way to avoid negative perceptions. There's definitely a stereotype of people [Christians] being really aggressive with their beliefs." This is in line with the prior literature in which scientists noted that "evangelism" was an attribute of religion that they perceived negatively (Ecklund *et al.*, 2011)

Finding 4: Centrality and Salience of a Christian Identity Matters for Students' Experience in the Biology Community

The degree to which someone sees a stigmatized identity as central to their self-perception and the degree to which the identity is salient in a context is important for whether that person will experience their identity negatively. If someone holds a stigmatized identity, but they do not see it as an important part of their identity, then they are less likely to experience that identity negatively (Quinn *et al.*, 2014). Further, if someone has a stigmatized identity and does not experience many contexts in which that stigma is apparent, they are also less likely to experience that identity negatively (Frable *et al.*, 1997). In the following sections, we describe how students perceive the centrality of their Christianity influences their experiences. We also describe the contexts in which students describe that their Christian identities often becomes salient in the biology community.

Centrality. Students varied in the degree to which they described their Christianity as central to their identities. We interviewed students who said they perceived their Christianity as a central part of their identities as well as students who said Christianity was not a central part of their identities. Students who said their Christianity was not important to their identities said they did not experience conflict with their identities in biology. For instance, Susan talked about how she has "never been super religious, so there was never this huge conflict," and Derek said,

> I think I gave [the survey] a kind of lower score in terms of conflict mostly because I grew up with a Christian background but I didn't feel like it was that influential or developed maybe. And so because of that, I felt like I didn't have these strong values and morals or beliefs that I felt were being challenged by science, mainly because I don't feel like they were really as present in my life.

In line with the experiences of those with stigmatized identities, Christian students who perceived their Christianity as less central to their identities perceived that they experienced less conflict in the biology community.

Salience. Students described several contexts for which their Christian identities became more or less important for their experiences in the biology community. For instance, many students described how the specific geographic region or institutional culture was important for their experience as a Christian student. Students in geographic regions that are majority Christian described experiencing less conflict when interacting with others in the biology community. Some students also noted that they would experience conflict depending on the field of biology they were studying. Several students talked about how scientists in the fields of medicine and agriculture

are more accepting of Christian individuals than scientists in fields like molecular or evolutionary biology.

Importantly, students also described how the other identities they hold can either increase or decrease the salience of their Christian identities. For instance, Janelle described how her Hispanic identity and gender increase the salience of her Christian identity in biology:

> Growing up as a Latina at a fairly White high school, I saw my Latino classmates being placed in remedial courses and it made me shun being Hispanic. I started pushing the idea that I was more Italian than Hispanic so I wouldn't get put into the remedial classes. So, I perceived everything about being Hispanic, including my religious identity, as being seen as less intelligent or less educated. That's a long-held [chokes up], excuse me, belief of mine. That if a conversation about my religion comes up at a scientific conference, potential mentors or advisors might have that same belief that I experienced in high school—I'm less educated; I'm less a qualified scientist because I believe in a certain religion. I think that that is the conflict that I expect. I don't know how to get over it, other than having more conversations.

While Janelle felt like her Hispanic identity increased the salience of her Christian identity, James, a Straight white male, described how his other identities decrease the salience of his Christian identity in the biology community, "I have a lot of other privileged identities … that give me a lot of insulation from the fear of retribution or being awkward." Further, William described how holding other more marginalized identities such as being gay and transgender overshadows any stigma associated with Christianity:

> I have other stuff that I'm always kind of holding close to the vest as well, because I'm not just gay but also transgender. So in terms of the line of things that I'm specifically thinking about whether I'm going to reveal or not to people, Christianity is kind of far back in the line.

These results indicate that certain contexts increased or decreased the salience of students' Christian identity. Students noted that Christianity is more accepted and therefore less salient in some geographic regions, institutions, and scientific fields. Students also noted that other identities such as race/ethnicity, gender, nationality, and LGBTQ+ identity influenced the salience of their Christian identities in the biology community.

DISCUSSION AND FUTURE RESEARCH

Through this interview study, we established evidence that Christianity is a CSI for biology graduate students. We found examples of students perceiving cultural stigma against Christians, anticipated stigma against Christians, and experienced stigma against Christians in biology environments. These stigmas against an identity in the context of academic biology are alarming and are a barrier for creating inclusive educational spaces for all students, but particularly students who identify as Christians. We encourage biologists to be thoughtful and considerate that, even if they do not agree with certain belief systems, these beliefs are not necessarily in conflict with scientific thinking. Discrimination and hostile remarks about Christians are not appropriate in the professional setting of academic biology. As academia continues to grapple with ways in which to be more inclusive, these conversations often focus primarily on gender, race/ethnicity, and generation status/income. However, it is paramount that inclusive spaces are inclusive for *all* individuals, and we encourage biologists to reflect on their definitions of inclusion so that they may include religious individuals such as Christians.

In studies of Christian undergraduates (Barnes *et al.*, 2017b) and now Christian graduate students, these students have said that discussions around evolution are a primary source of tension that they see propagated by biologists who are secular. So, one way that biologists can become more inclusive of Christian undergraduate and graduate students is to adopt a framework of religious cultural competence in evolution education, or ReCCEE (Barnes and Brownell, 2017) when discussing evolution. Specifically, the goal of this framework is to bridge cultural differences between secular instructors and religious students to teach evolution in a way that helps religious students feel comfortable, that their identities are respected and that religion and evolution are not necessarily in conflict. Instructional strategies that fall within this framework include providing examples of religious scientist role models who accept evolution (Barnes *et al.*, 2017b; Holt *et al.*, 2018), teaching the bounded nature of science (Southerland and Scharmann, 2013; Barnes *et al.*, 2017b), describing evolution as agnostic rather than atheistic with respect to God/god(s) (Barnes *et al.*, 2020a), and highlighting theistic evolution as an example of where religion and evolution can be compatible. For a more complete discussion of religious cultural competence in evolution, see Barnes and Brownell (2017).

To counteract the stigmas that Christian biology graduate students perceive, they made specific decisions to conceal or reveal their Christian identities to select individuals, self-distance from extremist Christian beliefs, and emphasize the positive aspects of integrating their Christian identities with their biologist identity. The study design did not allow for us to consider whether these impression management strategies were effective in helping Christians to overcome the negative effects of the stigma against Christianity. However, given the stark underrepresentation of Christians in academic biology, particularly in evolutionary biology, where a Christian identity is likely to be more salient (National Science Foundation, National Center for Science and Engineering Statistics, 2011), the numerical data suggest that these strategies are largely insufficient to retain Christians in biology. Because Christians make up 65% of the American public (Pew Research Center, 2019), we argue that academic biologists are missing out on a tremendous opportunity to help train Christian biologists to be boundary spanners and help communicate science to nonscientist Christians in a way that may be more effective than if atheist scientists try to communicate the same information.

The idea that Christian biologists can be a potential conduit between scientific and religious communities should be taken seriously by the biology community. Having a shared religious identity with a large percent of the United States population could allow these biologists to help communicate scientific findings more effectively to the Christian public. This echoes research on "boundary spanners" in workplace and management studies that highlights the effectiveness of individuals who belong to two identity groups for creating effective

intergroup relations (Richter *et al.*, 2006). Christian biologists may be effective boundary spanners who can help improve intergroup relations between scientific and religious communities. However, if we want Christian biologists to feel comfortable discussing their religious identities in biology, we may need to create a more inclusive environment where they feel secure revealing that they are Christian.

Finally, we found some evidence for the importance of considering how the stigma associated with Christian identity in biology is influenced by other identities such as gender, LGBTQ+ identity, and race/ethnicity. Our study indicated that other identities may influence the extent to which someone anticipates stigma about their Christian identity, and this is a ripe area for future research. Researchers can explore the Christian identity among specific populations of students, and our current data suggest that interviewing people of color who are Christian might yield important insights into how religion influences their experiences in biology. Further, using quantitative surveys, researchers could explore whether there are different levels of anticipated stigma across Christian students with varying gender, racial/ethnic, and LGBTQ+ identities.

The current study was able to determine the presence but not prevalence or average intensity of variables associated with holding a CSI among Christian graduate students in biology. However, prior studies have quantitatively documented cultural stigma against Christians in science (Rios *et al.*, 2015; Barnes *et al.*, 2020b) and perceptions of stigma against Christians in biology (Barnes *et al.*, 2020b). We know of no studies that have collected quantitative data from Christian students using variables associated with the CSI framework and analyzed those data to determine average levels of anticipated stigma, experienced stigma, salience, and concealing/revealing among Christians in the biology community. Future studies could build upon this qualitative study and use quantitative surveys to explore how these variables change in different contexts. For instance, we would expect that, for Christian biology students, thinking about revealing their identities to the general public would cause less anticipated stigma than thinking about revealing their identities within a community of biologists. Further, it would be interesting to survey students about the extent to which they feel anticipated stigma across different contexts of biology to illuminate where more inclusion efforts may be needed. This includes in different fields (evolutionary biology, agriculture), different professional contexts (classroom, lab spaces, conferences, informal gatherings with colleagues), and different geographic contexts in which Christianity is more or less prevalent (southeastern United States vs. Pacific Northwest).

Finally, given that the CSI framework has been useful for illuminating the experiences of students with depression (Cooper *et al.*, 2020b) and now Christian students, we encourage other researchers to consider using the CSI framework to explore the hidden identities of other groups that have not been extensively studied in the context of academic biology.

CONCLUSION

In this study we found that Christian students experience their identities as CSIs in biology. Given these findings, we suggest biologists avoid holding and expressing negative stereotypes about Christian students, who hold diverse beliefs and perspectives.

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