

Scientists Negotiate Boundaries Between Religion and Science

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Analysis of interviews with 275 natural and social scientists at 21 elite U.S. research universities suggests that only a minority of scientists see religion and science as always in conflict. Scientists selectively employ different cultural strategies with regards to the religion-science relationship: redefining categories (the use of institutional resources from religion and from science), integration models (scientists strategically employ the views of major scientific actors to legitimate a more symbiotic relationship between science and religion), and intentional talk (scientists actively engage in discussions about the boundaries between science and religion). Such results challenge narrow conceptions of secularization theory and the sociology of science literature by describing ways science intersects with other knowledge categories. Most broadly the ways that institutions and ideologies shape one another through the agency of individual actors within those institutions is explored.

Keywords: *religion, science, conflict, cultural strategies, boundaries.*

INTRODUCTION

As exemplified by Andrew Dickson White's 1896 landmark volume, *A History of the Warfare of Science with Theology in Christendom*, public commentators have often viewed the boundary between religion and science as one of static epistemological conflict (Brooke 1991; Brown 2003; Draper 1874; Granger and Price 2007; Leuba 1912, 1916; Nielsen and Fultz 1995; Rioux and Barresi 1997; Sappington 1991; White 1896). Although some recent scholarship rejects the conflict perspective in favor of viewing science and religion as "nonoverlapping magisteria" (Gould 1997), even this approach does not allow for discovery of the conditions under which science and religion might actually overlap or influence one another. We ask a random sample of scientists who work at elite universities how they see the relationship between religion and science and how they do or do not utilize religion in their scientific lives. Our study moves beyond the conflict paradigm and toward discovering when and how scientists see religion and science in conflict, what informs their vision, and the alternative models they develop for viewing the two entities.

Insights from 275 in-depth interviews with natural and social scientists at the top 21 U.S. research universities reveal that some scientists do see religion and science in conflict. Fascinatingly, most do not. Most important, scientists develop overlapping and context-specific narratives for negotiating religion-science relationships. Such narratives describe three dominant strategies: redefining categories (scientists use institutional resources from religion and from

Acknowledgments: This research was supported by a grant from the John Templeton Foundation, Grant #11299, Elaine Howard Ecklund, PI.

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science to redefine the other), integration models (scientists strategically employ other major scientific actors to legitimate a more symbiotic relationship between science and religion), and intentional talk (scientists are pushed by larger societal events to actively engage in discussions about the boundaries between science and religion).

Social scientists studying the science-religion relationship by studying scientists themselves have generally waded in one of two streams. They might support the conflict paradigm by arguing that as scientists develop their craft their levels of religious belief decrease (Larson and Witham 1997, 1998; Leuba 1916; Vaughn, Smith, and Sjoberg 1966; Wuthnow 1985). In the early 20th century, psychologist James Leuba used survey findings showing that members of the National Academy of Sciences were much less religious than the general population to argue that science would lead to total societal secularization (Leuba 1916, 1934). His study was replicated in the late 1990s with much the same results (Larson and Witham 1997, 1998)¹ and has been supported by other studies comparing groups of scientists to the general public (Stark 1963, 2003).² Yet, these studies only paid attention to the personal religiosity of scientists and did not address the full range of ways scientists view the connection between religion and science as knowledge categories.³

The second stream of research seeks to dispel the conflict paradigm by describing the differences in religiosity among faculty in different academic disciplines (Lehman 1974; Lehman and Shriver 1968). Researchers used findings showing that natural scientists—generally viewed as having the greatest commitment to science and scientific method—tended to be more religious than social scientists to argue that there was no inherent conflict between scientific and religious claims (Lehman and Shriver 1968; Wuthnow 1985). Yet, this argument still does not adequately explain the differences in scientists' relationship to religion when compared with the general population, and our findings revealed that field-specific differences are not a significant predictor of making an individual more or less likely to think there is a conflict between religion and science (Ecklund and Park 2009).

Examining the Boundaries

Although in general, sociologists of culture and of science have not examined directly how groups of scientists view religion, scholars in both fields have provided useful analytic concepts for understanding how boundaries between science and religion are created, maintained, and breeched (Lamont and Fournier 1992). Such study of boundaries is centrally about conceptions of difference. Scholars who do empirical work on boundaries have examined how actors understand their own differences with others or how groups create mechanisms that maintain difference between themselves and the "other" collective, leading to social inequalities—between genders (Collins 1992; Epstein 1992), ethnicities (Hall 1992), and social classes (Lamont 2000). Scholars have also recently become concerned with what factors lead to creation of high walls between groups and what factors likewise lead to the lessening of such distinctions (Cadge, Ecklund, and Short 2009; Ecklund 2010).

In one sense, we view scientists—and those at elite universities, in particular—as a collective uniquely positioned to comment on the relationship of science to other categories of knowledge

¹ Larson and Witham's work in replicating Leuba's original study did not examine a large group of academic scientists. Many members of the current National Academy of Sciences, for example, work outside universities.

² Stark has since recanted this earlier work, arguing that some forms of religion have been particularly supportive of the development of science (Stark 2003).

³ Gieryn's (Gieryn 1999; Gieryn, Bevens, and Zehr 1985) work is an important exception to this statement, although his work does not explore the content of religion itself or how different approaches to religion might change the construction of science.

and of actors. In another sense, we benefit from the insights of sociologists of science, who have argued that scientists are not a uniform group having the same notion of science but those who operate in and outside their laboratories on a range of different interests and values (Knorr-Centina 1999; Moore 1996). So different groups of scientists (both religious and nonreligious) might have distinct relationships to religion and religious people and remain actors “who sometimes exhibit commitments to multiple social identities,” (Moore 1996:1596). Because religion is one of the core knowledge categories with which science is historically and currently contrasted at the societal level, examining the potentially diverse ways scientists themselves view the relationship between science and religion at both the societal level and the individual level is crucial to understanding the particular mechanisms by which science constructs and is constructed by its actors (Brown 2003; Draper 1874; Gieryn, Bevins, and Zehr 1985; Monsma 1962; Rioux and Barresi 1997).

Sociologists of culture have argued that two central issues need further empirical work in the study of boundaries: how boundaries change and the mechanisms that lead to boundary crossing (Lamont and Molnar 2002). Without answering these two questions related to the study of boundaries we remain theoretically static, which would mean describing the connection between religion and science as primarily about conflicting or completely nonoverlapping—what Stephen Jay Gould calls nonoverlapping magisteria (Gould 1997)—knowledge domains at the societal level. We argue instead that theorists ought to uncover the specific conditions under which boundaries between religion and science are fixed by key scientific actors as well as those under which they overlap or become porous (flow from one into the other). In a direct way, analyzing how scientists comprehend the relationship between religion and science contributes to broader theoretical appreciation of the conditions under which boundaries are crossed and changed in the lives of individuals.

Sociologists of science, in conversation with those who study knowledge boundaries (Lamont and Molnar 2002), have contributed a concern with the “demarcation problem,” namely, the particular ways that boundaries between science and nonscience are drawn, according to different power-discursive struggles at the macro level, such as how science gained preeminence during particular historical periods (Downey 1988; Gieryn 1983, 1999; Gieryn, Bevins, and Zehr 1985; Moore 1996; Turner 1980). As Robert Wuthnow remarks in his examination of the institutionalization of science, the broader history of science has been narrated in two different ways. The “internalist approach,” which has remained the dominant narrative, has focused on the development of science “as truth . . . as the simple unfolding of an inner intellectual logic” (Wuthnow 1987:266). This narrative, however, fails to examine the development of science in light of its relationship to other social forces, ideas, and institutions, such as religion, and it therefore fails to portray science as an institution that must continue responding and adapting to outside forces, belief systems, frameworks, and movements that question or influence science’s own inner logic. Like Wuthnow and Joseph Ben-David before him, we also see science as shaped by “eminently sociological phenomena” that call for the examination of the interaction of science with the social environment (Ben-David 1971; Wuthnow 1987:267). Building on this tradition of understanding the institution of science in relationship to the social context within which it operates, we propose that one of the best methods to illuminate the ways that science interacts with the social environment is to study scientists themselves, particularly scientists who work at elite institutions, those who lead in shaping, defining, and preserving the institution of science.

Weaknesses of Existing Research

When science has been examined in light of the influence of religion, whether supported or challenged, the conflict paradigm has dominated theories that seek to explain the relationship. The question of how scientists themselves understand the connection remains empirically unexplored. For example, much earlier work on religiosity among scientists assumes lack

of participation in traditional religion as upholding the conflict paradigm (Larson and Witham 1998; Lehman and Shriver 1968; Leuba 1916, 1934; Stark 1963, 2003), yet scientists who are not traditionally religious could employ methods of negotiating the religion-science connection apart from antagonism. Researchers have not asked scientists directly how they view religion or the relationship between religion and science, thereby neglecting examination of the variety of ways scientists may view the relationship between these categories outside the conflict/no conflict framing. Methodologically, the few studies that have examined religion among scientists generally employed narrow measures of religion, such as belief in God and attending a house of worship. They did not allow for the broad range of religious expression that might be present among scientists. Further, the survey research methodologies of most existing studies lock respondents into categories *a priori*. This is not the right method to uncover new categories and strategies for how academic scientists view the relationship between religion and science. In this study we used qualitative interviews, allowing narratives about science and religion to emerge in light of personal histories and particular life experiences.

We show that in general, the either-or conflict paradigm is not the most accurate framing of the relationship between religion and science for this population. Further, we find that scientists generally do not compartmentalize science and religion as some other research might lead us to believe (Larson and Witham 1998; Lehman and Shriver 1968; Leuba 1916, 1934; Stark 1963, 2003). For the minority of scientists interviewed who do see religion and science as conflicting, their own narratives allow us to understand why they see these entities in conflict and how their definitions of science and religion shape one another. And for the many scientists who expressed a more porous boundary between the two domains, we contribute conditions when these boundaries change and are crossed, a topic largely ignored in the sociology of science and the sociology of religion literatures. In particular, we examine how scientists' reconstruction of religion as "spirituality" makes their fields more accommodating of religious ideas. Surprisingly, our findings reveal that these elite scientists do not parse out their beliefs about religion and science, segregating the two between their private and public selves, but that instead they build very coherent narratives to explain their understanding of the world, whether that understanding is scientific, spiritual, or religious. In other words, the respondents in general did not maintain one belief system when operating as scientists, only to trade that belief system for another when they leave work to go home.

Drawing on systematic analysis of qualitative interviews with a portion of these scientists, we discover three specific means of boundary change and crossing: redefining categories, integration models, and intentional talk. Investigation of such dynamics draws from the sociology of culture literature by examining conditions when boundaries change and are crossed, particularly for the understudied domain of knowledge categories. We also bring more precision to arguments about the social construction of science (Wuthnow 1987) by examining how scientific knowledge is understood when definitions of religion change.

Studying these dynamic boundaries remains immensely relevant to both the sociology of science and to the sociology of religion because neither science nor religion is a static, closed entity, unsusceptible to change brought on by outside influences. Rather, we see science as fully institutionalized because it is able to maintain an internal logic and structure in the midst of great change in its surroundings. Yet, science is paradoxically also able to adapt or modify that internal logic and structure in response to changes in its surroundings, further preserving the integrity of the institution in the face of new challenges that continually emerge to influence or question it (Wuthnow 1987). Scientists (particularly those who work at elite institutions) are enmeshed with the institution of science itself. To study their views is to study the institution of science. Examining, in particular, how scientists view the boundaries between religion and science remains a delicate balance, as these boundaries are continually shifting, and it is therefore necessary to examine both the ways that scientists respond to broader societal discourse about science and religion (such as debates about embryonic stem cell research or evolution) as well as the ways

that scientists experience the relationship between religion and science on a personal level. In fact, it is very difficult if not impossible to separate these two levels of analysis. Therefore, the sociological project is not to draw clear lines that indicate absolute distinctions between science and religion; rather, it is to investigate “the distribution of ideological patterns” among scientists themselves (Wuthnow 1987:148).

METHODS

In spring of 2005, 2,198 tenured and tenure-track faculty in the natural and social sciences were randomly selected from among all those in the seven fields of biology, physics, chemistry, sociology, economics, psychology, and political science at 21 elite U.S. research universities (Ecklund 2010). These natural and social scientists were studied because they are more likely to have an impact on society-wide knowledge creation and more likely to be inextricably linked to the institution of science, meaning that our study has the ability to broaden understanding of issues related to societal change as well as how institutions shape ideas within a particular social context (Collins 1998; Lindsay 2006; Rado 1987; Wuthnow 1987). As these scientists are thought leaders in science, they are poised to influence other major institutions, including not only other universities, but also science-related industries as well as education, healthcare, and public policy, systems that affect the daily lives of every citizen. In addition, those who work in these science-related industries often do their doctorate work at elite research universities, and thus scientists at these universities directly affect the development of leaders in various sectors. Finally, earlier studies have shown that not only are elite scientists less likely than nonelite scientists to consider themselves religious (Leuba 1934), but also those who attend elite universities are less likely than those who attend nonelite universities to call themselves religious (Stark 1963, 2003).

Seventy-five percent of these individuals responded to a 15-minute web survey about their attitudes toward religion and religious beliefs. More detail about university selection and results from the survey data are discussed extensively in another article (Ecklund and Scheitle 2007), but, briefly, the universities were selected according to their ranking on the University of Florida’s annual report of the “Top American Research Universities,” which had common selection criteria as other studies of top research universities (Bowen and Bok 1998; Massey et al. 2002).

It was necessary to employ a method that would allow discovery of new categories and strategies for how scientists structure meanings of religion, science, spirituality, and the relationship between these. To this end, 501 of those who completed the survey were randomly selected and asked to participate in a longer in-depth interview. At least 50 individuals were selected from each of the seven fields. Between July 2005 and March 2007, 275 interviews were completed, mainly by the first author, either in person or over the phone. The qualitative interviews ranged from 20 minutes long to two and a half hours, and all were transcribed. Respondents were asked specifically how they understand the terms “religion” and spirituality. They were also asked if religion had any influence on their specific discipline or their particular research as well as how they perceive the relationship between religion and science. The following questions, from the interview guide, were used to address these topics:

1. I’m going to use the words religion and spirituality interchangeably here, recognizing there is a lot of public discussion about the differences between these terms. Could you say a bit about how you understand the terms religion and spirituality?
2. How do religion and spirituality come up, if at all, in the course of your discipline?
3. How about in teaching, does religion or spirituality come up at all in interactions with students or teaching and in what kinds of ways?
4. I’m also interested in the relationship between religion and your work as a scientist. How does religion (or spirituality) influence the work you do as a scientist?

5. On the other hand, how does being a scientist (social scientist) (if it does at all) influence how you think about or view religion?
6. Some say there is a “conflict between science and religion.” How would you respond to such a statement?
7. How about now for you personally, how would you describe the place of religion or spirituality in your life?
8. What religious or spiritual beliefs do you hold (religiously or spiritually speaking)?
9. If you have a religious tradition, in what specific way does being part of that religious tradition influence your life now? What kinds of things do you do to practice being part of that religious tradition?

Note that open questions about how scientists see the relationship between science and religion as well as definitions of religion and spirituality were asked before the idea of conflict between science and religion was introduced in the interview. We wanted to make sure that the idea of conflict between religion and science was not introduced before respondents had a chance to express alternative ways of viewing the connection. This particular question ordering, having been field-tested by doing 10 pilot interviews with scientists, measured the efficacy of existing ideas among this population about conflict between religion and science while, at the same time, allowing respondents to generate new categories outside of the conflict paradigm.

In addition, the phrasing of the questions allowed respondents to reflect on the conflict between religion and science on an institutional level as well as the way the respondents experience the conflict between religion and science on a personal level. To understand a broader range of ways scientists view the connection between religion and science as knowledge categories, while we encouraged respondents to distinguish between public and personal conflicts between the two categories, we intentionally did not ask separate questions about institutional conflicts (most often related to embryonic stem cell research and evolutionary theory) and personal conflicts, which may be experienced as an individual effort to reconcile spiritual beliefs with scientific practice. Indeed, we see these two experiences as potentially overlapping and inextricably linked. Specifically we did not explicitly introduce the ideas of intelligent design or evolution into the conversation, allowing scientists to introduce these topics if they felt such ideas were relevant to the conversation, and we did not explicitly define the difference between the public and personal conflict between science and religion. Rather, giving respondents the freedom to lead the conversation into a discussion of either the personal or the institutional or both illuminated the ways that institutional conflicts often become personalized and vice versa. This approach allowed us to examine the continually shifting boundaries between science and religion in complex and layered ways. It revealed not only how science as an institutional whole approaches religion, but also how the people working within science use agency to innovate new relationships between science and religion at the borderlines of these two realms, thereby, in some cases, bringing change to the institution as a whole.

Finally, we asked respondents about their own understandings of both religion and spirituality because we wanted to see the full range of ways that scientists create meaning and higher-order purpose in relationship to or outside of science. Because scholars who talk about spirituality among the general public say that spiritual but not religious people sometimes utilize spirituality to create the higher meanings of religion without the institutional constraints of religion we wanted to ask our respondents their own definitions of spirituality.⁴

⁴ In another paper we have extensively discussed how scientists appropriate conceptions of spirituality that are different from or similar to the general public (Ecklund and Long 2011). Here we are only interested in understanding scientists' spirituality as related to our main research question of how scientists understand the relationship between religion and science.

A team of 12 students and one of the co-authors worked on coding the interviews. In light of previous research (Lehman and Shriver 1968; Stark and Finke 2000; Wuthnow 1985), we developed some codes *a priori* for testing existing theories about interdisciplinary and interfield (natural and social science) differences in views about the religion-science relationship as well as definitions of religion, spirituality, and science. (Yet, as mentioned before, we did not find significant differences between the views of natural and social scientists or among specific disciplines.⁵) Once the interviews were thus sorted, we used a modified form of the inductive coding scheme (Strauss and Corbin 1990) to develop semi-inductive categories of the ways academic scientists viewed religion, science, and the relationship between them. We then systematically recoded the interviews. Our final coding scheme was tested for intercoder reliability and achieved a reliability statistic of .90. When a passage was not coded the same, a code was revisited and improved to achieve consistency.

FINDINGS

When asked about their own views on the relationship between religion and science, respondents fell into three categories. About 15 percent of scientists who completed in-depth interviews said that religion and science were always in conflict. Another 15 percent said they were never in conflict. About 70 percent of those interviewed gave specific contexts in which religion and science are in conflict and others where they are not. The narratives of all three groups of scientists provide important insights into issues related to boundary negotiation.

Always Conflict

For the group who thought science and religion were always in conflict, the definitions of science generally fit in an ideal-typical way into Robert Merton's "normative structure of science" (Merton 1973; Zuckerman 1988). Such respondents had a positivist view of all knowledge, believing that, as Merton outlined, science was based on data that could be judged impartially. Analysis of the interview responses further revealed that, according to Merton's categories, this group of respondents often believed that the scientific method protected science from personal bias. There was a sense of organized skepticism. Respondents emphasized that scientists worked together as part of a community, meaning science was always protected from any one individual having too much power in its production.

Religion was relevant to this group of respondents as a way to distinguish what science is and what it is not; this group believed scientific knowledge trumps all religious knowledge. When judged according to the same criteria as science, religion did not measure up because it was not based on data that could be judged impartially. According to this group of scientists, a personal bias existed in religion, because religious individuals had a stake in findings that supported their faith.

These scientists viewed both religion and science as static categories. All religion was classified as "fundamentalist" as expressed by a chemist (with no current religious affiliation):

Well, there clearly is conflict between organized religions and science The dogma that religion is maintaining is contrary to science. They're going to lose eventually, I think. The earth is no longer flat I've gone through

⁵ The lack of differences between natural and social scientists is addressed more extensively in another article (Ecklund and Scheitle 2007). Although the data used for this article do not include anthropologists, as previous studies have, the RAAS (Religion Among Academic Scientists) study did replicate many of the questions used in previous studies of natural and social scientists' views on religion. The assertion is not that previous studies are inaccurate, rather that scientists' views as well as broader societal influences remain dynamic in nature and are thus subject to change. For example, religiosity has decreased among the general public and this may have some bearing on the way scientists view religion.

a long enough life to remember that certain of the things that are required [by religion] are kind of stupid. Fish on Friday. That was a good one!

The context that this respondent was speaking into was the broader societal conflict between religion and science, and he saw religion as proposing claims inherently antithetical to science. He quickly makes things more intimate, however, explaining that, in addition to current societal conflicts, religion and science are in conflict for him personally as well.

The conflict between religion and science also resulted from competing notions of truth and believing that science holds the ultimate form of truth in all categories of knowledge. A sociologist, who described himself as Jewish, explained:

I think there's conflict between science and any belief system because science is the means by which we determine empirical truth. Every belief system asserts some empirical truth, and so science is a threat to . . . religious belief.

This sociologist almost perfectly fits into Merton's categories. Science is the sole means by which truth is determined. Religion cannot be tested empirically, and for this reason there is a conflict between science and any other systems of knowledge that claim access to truth, including religion.

Another respondent, a physicist, further explained that science and religion were based on different ways of knowing because science required "demonstration and experimentation" whereas religion relied on "faith and historical documents and readings."

Similarly, a political scientist said he is not part of any religious tradition, explaining that his geologist father raised him "knowing science instead of religion." When the interviewer asked the political scientist what he thinks the terms religion and spirituality mean, he explained:

The feature of religion that I worry about is the extent to which notions of faith and notions of rationality and reason are compatible. Everything about my own research is about testing a set of hypotheses and leaning up against them and seeing what the limitations of them are and not believing anything . . . And religion, as I understand, it is a different gig . . . it isn't just that it's different but it's also incompatible with what I see as basic social scientific method.

It is clear from these quotes—and from systematic coding of the other interview transcripts—that the group of natural and social scientists who saw religion and science as irreconcilably in conflict saw religion in direct opposition to their work as scientists. On an institutional level, science and religion were utterly incompatible epistemologically, and on a personal level, these scientists could not embrace religion because it ran counter to their ways of understanding truth. In most cases, these scientists had a restricted, fundamentalist notion of religion. Scientists who adopted a conflict perspective tended to see science in an ideal-typical Mertonian form (Merton 1973), rather than having a particular version of science related to their specific discipline. Indeed, as with religion, we found no broad differences between the natural and social scientists in terms of views on science. Those who adhered to an unwavering conflict position held religion under the light of science, and religion failed. In addition, beyond just seeing science as attached to empiricism, these respondents saw empirical knowledge as the only true kind of knowledge. Members of this group came from disciplines across both the natural and social sciences, not only those fields, such as biology, currently embroiled in public science-religion debates in the United States.

No Conflict—Rigid Boundaries

About 15 percent of the qualitative interview respondents said that religion and science were not in conflict. When individuals gave this response, they were asked how they understood both this seeming lack of conflict as well as the relationship of religion and science outside the conflict paradigm. These individuals fell into two broad categories religiously. On the one

hand, respondents said that religion and science are not in conflict for them because they are not religious. For these individuals there is a barrier erected between the two; science and religion are not in conflict because religion is *outside* of and—according to many in this group—generally “irrelevant to” science. Religion and science were separate, with science being a far superior form of knowledge than religion. In this way, these respondents were somewhat similar to those who fell in the “always in conflict” category because they saw science and religion as separate and inherently different. Yet, we placed them in the “no conflict” category because they came to a different conclusion about the connection between science and religion. Rather than perceiving a battle between the two, which science will inevitably win, as it disproves religious dogma through further scientific discovery, these respondents often saw science and religion more as nonoverlapping magisteria (Gould 1997). They were so irrelevant to one another that they were not even in conflict. Those who espouse the idea of nonoverlapping magisteria view religion and science as inherently dealing in two different kinds of truth, with science grounded in empirical truth and religion in meaning.⁶ They therefore had a hands-off approach to religion.

For example, a chemist, who said he is irreligious and a devout atheist, held himself in contrast to those who are religious:

Other people have their beliefs, and they are more than welcome to have those beliefs. So someone believes that the earth is 10,000 years old. I could talk to them until I'm blue in the face, but it's not going to change their belief and their religion. So I just let them believe what they want.

For this chemist, religious ideas—and the people who hold them—are fairly irrelevant to the scientific enterprise and have no potential of being shaped by scientific understanding. He does not necessarily ascribe to Gould's idea of nonoverlapping magisteria, but he does maintain that there are rigid boundaries between religion and science. Both institutionally and personally, these respondents experience wide gaps between religion and science.

No Conflict—Pourous Boundaries

The other group of scientists who reported no conflict did so because they understood the boundaries between religion and science as largely porous, with the possibility of either one influencing the other. In this sense, they also fit into the “no conflict” category, but interestingly only because they saw religion and science, to a certain extent, as overlapping with specific ways to influence one another. For these individuals, religion was often personally important, and it shared with science some similar knowledge parameters. As one Episcopalian chemist explained:

As a scientist you're always on the cutting edge . . . I expect religion to kind of work the same way, so the idea of something just stable and fixed, that you can't really have any new ideas . . . Things that we've learned in the past 2000 years, that has to be factored into those old truths. Religion has to be dynamic. There has to be research and new ideas and sometimes as a scientist you participate in creation.

What is most interesting about this quote is the overlap between boundaries that it exemplifies. This chemist essentially afforded science and religion the same knowledge structures. New discovery was experienced through both, and for both there was even the possibility of creation. Science and religion each should be expected to change as new experiences provide them room to do so. This respondent saw both religion and science as valid avenues of knowledge, able to bring broader understanding to valuable questions.

A sociologist who described himself as a practicing Unitarian Universalist said, in response to being asked whether science and religion are in conflict:

⁶ We thank an anonymous reviewer for insight into Gould's ideas.

Such a statement is typically made by someone who's a partisan on one side, not someone who is trying to find all of the tools that are available to explain the character of our world and the place of humans in it. There's just too much evidence of people being very thoughtful and creative working on both sides or working with both traditions of the inquiry I think it leads people to reject forms of learning It is much more productive to say that we should use all the tools that we have available, religious and scientific to address these profound questions, not use that to drive wedges between us.

Notice, similar to the Episcopalian chemist quoted above, this respondent sees both religion and science as providing valid forms of knowledge and tools to answer important kinds of questions. He even sees science and religion influencing one another.

Indeed, those who are religious and who view religion and science as without conflict often have a fairly uniform way of understanding the connection between the two; *both* religion and science are important forms of knowledge, able to bring broader understanding to valuable questions but cannot be completely compartmentalized. Individuals professing this view were generally religious but came from a broad range of religious perspectives, including traditional Catholics as well as Unitarians. While those who thought that religion and science were always in conflict or those who saw science and religion as nonoverlapping magisteria sometimes saw science as limitless, respondents who did not discern a conflict because they saw science and religion as equal sources of knowledge generally posited limits to scientific understanding, limits that religion (and particularly certain forms of it) had the ability to illuminate.

Sometimes in Conflict

Most important to understanding issues of boundary crossing and change is the distinct group of individuals who say that religion and science are only "sometimes" in conflict. This group, 70 percent of respondents, provides the most empirical insight into the strategies of boundary negotiation as their perceived conflict was selective and highly dependent. Similarly, those who indicated that religion was sometimes in conflict with science generally had in mind a particular kind of religion (and religious people and institutions) that conflicted with science and a particular kind of religion that didn't. In comparison, the group who thought that religion and science were always in conflict had a very restricted notion of religion as being uniformly fundamentalist forms of Christianity. Hence, that first group only defined religion in those terms. Instead, the group who thought that religion and science were sometimes in conflict had a more nuanced and context-dependent notion of religion. We realized these distinctions after we coded the interviews for how individuals defined religion and, in particular, the descriptors the respondents attached to religion. These descriptors emerged in positive and negative clusters, which the respondents often labeled as characteristics of "good" and "bad" religion.

The always in conflict group generally used bad descriptors to describe religion whereas the "sometimes" group had sets of good and sets of bad descriptors attached to religion. Good religions, to the sometimes group of scientists, are changeable in the face of new information; they are "adaptable," while bad ones are "rigid." Good religion is based on "moral principles," whereas religions described in negative terms are based mainly on "moral commands." Good religion encourages a "plurality of beliefs"; bad religion imposes "uniform belief structures." Good religion "remains in its domain," as opposed to bad religion, which "intrudes into other domains" (especially that of science). The religion that this group of respondents most often described in positive terms was Buddhism. Evangelicalism and fundamentalism (labels these respondents generally used interchangeably) earned the bad label most often (Marsden 1991).⁷

⁷ Most scholars of religion do not lump "evangelicalism" and "fundamentalism" together, but recognize them to have distinct historical processes of development. Further, the members of each often work to distinguish themselves from the other (Marsden 1991).

When natural and social scientists in the “sometimes” group talked about the connection between religion and science, they were engaging in what Pierre Bourdieu has called a “classification struggle,” building strong boundaries between good and bad religion worked out according to binary oppositions (Bourdieu 1988).

Strategies of the “Sometimes” Group

We identified three strategies of action (Swidler 1986) that scientists used for navigating the religion-science boundaries under the conditions and contexts when science and religion could overlap. These strategies include redefining categories, integration models, and intentional talk. While the “always in conflict,” “not in conflict,” and “sometimes in conflict” categories represent different groups of people that view the relationship between religion and science in different ways, the cultural strategies of “redefining categories,” “integration models,” and “intentional talk” might even be employed by the same individual for understanding the context-dependent nature of the relationship between religion and science.

Redefining Categories

Respondents who viewed religion as only sometimes in conflict with science tended to manage the science-religion relationship by changing the definition of religion. Specifically for them, religion most compatible with science would be best defined as spirituality. On the whole, scientists were more spiritual than we had expected. Across all disciplines, 68 percent surveyed considered themselves spiritual to some degree. They used this label to mean a variety of things, from a vague feeling of something outside themselves to a deep and compelling, other-centered worldview that directed how they conduct research and interact with students. To an extent, this mirrors what Robert Wuthnow and others have found among the general public (Wuthnow 1998).

Although an earlier generation of historians talked about the movement away from religion on campuses (Marsden 1994), some recent scholarship has argued that religion and spirituality on American campuses is thriving—particularly nontraditional forms of religion, and particularly among students (Bonderud and Fleischer 2003; Lindholm and Astin 2006; Schmalzbauer 2007; Schmalzbauer and Mahoney 2008; Wolfe 1997). Likewise, respondents mentioned the importance of spirituality (including yoga and meditation) and religion (broadly defined) on their campuses. For them, spirituality sometimes crossed into science, providing insight. For us, understanding larger institutional transformations from religion to spirituality—or perhaps a reclaiming within religion of historical spirituality (Schmidt 2005)—provides a fuller understanding of what it is that these scientists find distasteful about religion.

On the whole, scientists are more spiritual than we had expected and scientists who view themselves as spiritual are also less likely to see religion and science as in conflict. By broadening the definition of what constitutes religion to include noninstitutionalized forms of spirituality—scientists *are drawn* from within the realm of science into the realm of religion. These scientists use a redefinition of religion as about spirituality; the boundaries between religion and science become porous and the nature of science is also redefined. The result of this redefinition is an openness to interchange between the two realms of existential meaning and empiricism. Science can be described as hard, objective, and rational—when held in contrast to fundamentalism or evangelicalism (when the boundaries do not overlap)—and then morph into a matter of beauty and insight when held in a symbiotic relationship with spirituality (where the boundaries do overlap). One example was a biologist (who described himself as a spiritual person currently searching for the right religious home):

There are many paths up the mountain, and a lot of times the most important parts of science are nonrational . . . I think at the most important level it has a lot more similarity with artistic expression. So a lot of times it's nothing logical or rational that leads to insight . . . Sometimes people describe it as “a leap of faith.”

For a physicist—who described himself as a spiritual person who reads Buddhist and Hindu texts for enlightenment—“conventional” religion acted as an impediment to science, but spirituality had the ability to influence science in a positive way:

The received doctrines of any conventional religion have not been very helpful in understanding the world scientifically. On the other hand, the general idea of spirituality, which is also incorporated in many religions, is that there are universal principles, [which indicate that] it's an important thing to understand the world and that it can be understood . . . that at least this part has a meaning . . . and you can look for bigger meanings. That is a very important part of what goes into choosing what problems to do [in science].

When this respondent compared spirituality—rather than religion—to science, he actually used the word “believe” to describe the search for solutions to scientific problems. Clearly, ideas of religion are informing spirituality, giving scientists an alternative language to talk about scientific discovery. For others too, spirituality not only flows *from* science but flows *into* science, providing actual scientific insight. Individuals who said science and spirituality were compatible did not consider their worldview dualistic. When the interviewer asked a biologist who sees himself as spiritual but not formally religious, whether he thinks there is a conflict between science and religion, he said:

I think that depends on what you mean by religion. If you're talking about organized political movements, if they're associated with some organized religion, then there's obviously conflict. And you just have to open the paper to find it. Otherwise I don't, I wouldn't generalize other than that. It can be, I guess, personally for some people, it might be that they feel conflict but some do not see any conflict at all between having a spiritual life and a science . . . I guess in my idea of spiritual life there's nothing that isn't in my idea of scientific life . . . There are plenty of people who do have a kind of dual-world view, but I'm not one of them.

In this case, the respondent distinguished between the conflict between science and religion on an institutional level, which he sees playing out in the public, and on a personal level, where he experiences science and religion as deeply overlapping realms. For this scientist the degree of the conflict depends on the level being discussed.

Different from those who think there is an irreconcilable conflict between religion and science, this set of respondents chose to redefine religion as spirituality. While religion might indeed be in conflict, these scientists generally believed that spirituality is definitely not in conflict with science. We found that scientists are not only pushing science into the realm of religion via spirituality they are also *allowing* insights from spirituality into their science. This connection between science and *spirituality*—when compared to science and religion—may provide fruitful terrain for increasing the public legitimacy of science.

Integration Models

Another cultural strategy used by the “sometimes in conflict” scientists was to point to other scientists (sometimes outside their departments or even disciplines) who they believed had successfully integrated religion and science. We call this strategy integration models. And surprisingly, these models often adhere to traditional forms of religion, revealing that crossing boundaries between religion and science is not *only* a matter of redefining religion into spirituality.

The language used to describe these models of integration was also surprisingly complimentary. We had expected that strongly religious scientists (particularly evangelicals) would be derided by their peers in the same way as was their religion. Despite the high levels of religiosity displayed by the exemplars, however, they were described in very positive terms. It would appear, then, that, under certain conditions, when conservative religion is bundled with science—rather than pitted against it—the integration of religion and science is not so distasteful to scientists.

A leading religious scientist mentioned often across disciplines was Francis Collins, former head of the Human Genome Project and current director of the National Institutes of Health (Collins 2006). Collins, a fairly outspoken evangelical Christian, was referenced by a plurality of respondents (even those who also described evangelicalism as negative) as evidence that religion and science did not have to be in conflict. Consider the thoughts of a sociologist—who described himself as culturally Jewish (although not practicing):

There are some people with very deep religious beliefs who simply don't let those things conflict. One of the lovely examples that I heard about just recently is this guy, Francis Collins . . . He is the Director of the gene-mapping outfit at NIH, and he's a very serious born-again Christian and obviously a firm believer . . . and obviously manages to live very well with that.

A biologist—who is a Catholic but has currently taken a break from religion because of what he described as “its use by U.S. politicians”—explained that “[a]s humans we always say that there's something we don't know . . . So we could always find a place for religion . . . I have read a lot about really famous big scientists [who] really have an incredibly intimate relation with religion, and so I don't think it is completely incompatible.” When asked if he was thinking of anyone in particular, this biologist responded, “Yeah . . . Francis Collins. They say he's an evangelical Christian, and he still believes in Darwin, so . . . I don't think that even Darwin and religion are incompatible.” According to his own narrative, the reason this respondent thought that religion and science were not in conflict is because of the examples of important scientists who modeled the compatibility between religious belief and scientific understanding.

Another prominent scientist that many respondents mentioned positively was Kenneth Miller, an outspoken Catholic at Brown University, and other respondents used less well-known models. For example, a chemist said she had no religious identity but considered herself spiritual. When asked how religion came up, if at all, in the broader discipline of chemistry, she talked about her teaching:

I just tell students that there are creative ways to integrate these different parts of your life. There's this great website from a scientist who does radio-metric dating of things that are billions of years old . . . He's a very religious Christian, and he takes on a lot of the myths that are out there—that are on a lot of fundamentalist Christian websites—about radio-metric dating being wrong . . . I provide this as an example for students as someone who has managed to integrate their twentieth century science with their religious views.

Although this professor clearly did not consider herself traditionally religious, she did point out favorably other scientists who were, and who were able to integrate faith and science. She was even exposing models of integration to a future generation of scientists.

Intentional Talk

A third way that scientists managed boundaries between religion and science was through the cultural strategy that we call intentional talk, the most common strategy of the three we present. Using intentional talk in their classrooms and other arenas, scientists responded to the broader debates about science and religion by actively creating and engaging in dialogue about these debates. Rather than ignore debates about science that were occurring outside of the academy, they chose to directly address those debates within the academy. It is clear that the controversy over intelligent design that was taking place during the time when most of these interviews were completed provides a sort of natural lab for how scientists engage with religion when there is public foment surrounding the relationship between the two (Bartlett 2006; Behe 2005; Cuomo 2005; Goodstein 2005). Perhaps unsurprisingly, poll data revealed that scientists as a whole are substantially different from the American public in how they viewed teaching intelligent design in public schools (Hess 2006). Nearly all of the scientists—religious and nonreligious alike—had a negative impression of the theory of intelligent design.

Although the interviewer intentionally did not mention intelligent design or any religious response to evolution, respondents consistently introduced the topic. Some respondents, particularly natural scientists who thought that religion and science were always in conflict, argued that foment surrounding teaching intelligent design had further cemented their opinion. For other respondents, however, events outside the university had actually served to push them from the realm of science into the realm of religion. Public events caused them to think about religion, even if they would never have otherwise. To understand this trend, we look to Wuthnow's work on institutions, which argues that institutions especially have to adapt or go through a process of reevaluation when the society outside that institution experiences "disturbances in moral obligations" (Wuthnow 1987:155). To extend these ideas to the present case, as debates over intelligent design and stem cell research have taken on a moral tone, scientists have found themselves compelled to respond in innovative ways when dealing with science and religion. Unlike some respondents who simply chose to ignore the broader debates about science occurring in other societal sectors, respondents who used intentional talk as a strategy to discuss the relationship between science and religion addressed the controversies surrounding their profession. Many times, the classroom provided the ideal setting for these scientists to engage in this intentional talk.

One biologist, an atheist not part of any religious tradition, told us that she was "rather surprised at how many of our students are very religious. I am always just so surprised, and I'm the other way [not religious]." She also explained that she made a sincere effort to present science such that "religious students do not need to compromise their own selves." Although she personally was not reconsidering what she thought about religion, she was being pushed by forces in the societal environment surrounding the university to seek out religious resources to keep her religious students engaged with science.

Some scientists, however, found that current public debates were causing them to reconsider their own beliefs. A chemist, who attended a Unitarian church and personally stated that "God is not important" to him, became introspective when asked whether public discussions about religion and science influenced his research:

I don't think that they affect my research—they certainly affect me . . . first of all professionally it affects me in that it causes me to reflect on what my role as an educator is and my role in society since I am an expert in a certain area of science. It causes me to think, "what is my responsibility to communicate to the general public about how that expertise has an impact on public policy in this case?" Then, more personally, well I think it certainly requires that I reflect on my own thoughts and my own beliefs.

A psychologist—an agnostic not currently a part of any religious tradition—said that such public debates were forcing him and his colleagues to think more seriously about the place of religion in their teaching:

I think they [students] should hear about it [intelligent design], not so much in the context of biology, because it's not a theory of biology. But it is an important social issue, which has to do with the intersection of biology and society. Students ought to think about what the boundaries are and what science contributes and what it cannot contribute. I mean, it [science] cannot contribute a moral system The evolutionists have made a big mistake by getting all upset about discussions of intelligent design.

This respondent did not think that intelligent design ought to be taught as science, but he did think that discussions about religion ought to be brought into the science classroom (to help students understand the boundaries around science). Like this agnostic, others who thought that religion should be more openly discussed in classrooms were not always themselves religious. Their opinion was more based on their sense of what it means to be a good teacher and a good scientist, so they were generally reflecting on the conflict between religion and science on the institutional level, and yet, as the above example of the Unitarian chemist illustrates, the public debate sometimes caused respondents to assess their personal beliefs as well.

DISCUSSION AND CONCLUSIONS

We found that when religion is defined as evangelicalism or fundamentalism the boundaries between religion and science—unsurprisingly, given current public debates at the time these data were collected—are strong. In contrast, however, a significant group of scientists think that religion and science are sometimes in conflict and sometimes not in conflict. In particular, these natural and social scientists view science differently when held in contrast to religion compared to the way they view science when held in contrast to spirituality. When religion is redefined as spirituality it has the potential to flow *from* as well as *into* science. Such findings move toward uncovering conditions where religion might influence science rather than seeing science as the only change agent in this “conflict” (Evans and Evans 2008).

Our findings about scientists who point to “models of integration” were particularly surprising as such models were often highly religious individuals from religions otherwise described by respondents in fairly negative terms. These results paint a different picture than previous scholarship on the public discourse surrounding the Scopes monkey trial and the creation science debates, which almost uniformly argued that such events were sites for science to demarcate itself from religion (Gieryn, Bevins, and Zehr 1985). Even in a climate of religious factions, such as the intelligent design controversies, there is a distinct group of respondents who do not retreat from or suppress discussion of religion but rather enter the realm of religion. For example, even scientists who are atheists have the potential to enter the realm of religion to find resources to help their students learn science, what we call intentional talk. Existing research has revealed that intelligent design may even be gaining momentum as a social movement because of opposition from scientists (Binder 2007). Our findings suggest that scientists who are willing to be pushed by such public debates to actually engage students can find productive areas of dialogue that only serve to increase the cultural authority of science.

In the broadest sense, by employing a more creative approach to the connection between the constraints of institutions and the agency of individuals we are able to move beyond the uniform conflict narrative that has dominated the science and religion literature. Instead, what we see from these data is that social change is not linear, that people have agency and create their own meaning out of social change, and that we ought to let the data guide us in how we ought to be thinking about such dynamics.⁸

Our results indicate that actors—especially elite actors like the kind of scientists we studied who work at top universities—have the opportunity to act on the institutions that constrain them. Our respondents cannot be separated easily from the institution of science itself; they could even be called institutional leaders and appropriators, meaning they have incredible agency within the constraints of the scientific institution. From the perspective of agency they used changing definitions of religion (as spirituality) to construct understandings of science in ways that made it more compatible with spirituality. From the perspective of institutional constraints our findings also revealed the circumstances under which changes to surrounding environments (such as the intelligent design controversies led by religious institutions) influenced the range of choices within the context of academic science, that scientists had available to respond to knowledge categories like religion. For example, university scientists are constantly exposed to “the public” through the very students they teach. Each year they are confronted with students who bring public debates about religion and science into their classrooms. Even those natural scientists who had no previous interest in religion experienced changes to the environment that pushed them into the realm of religion to engage their students more effectively.

Intentional talk is not the only cultural strategy where definitions of science in relationship to changes in other knowledge categories (in this case, religion) shift. For example, there is a group

⁸ We thank the editor for this helpful comment.

of scientists for whom changing conceptions of religion in their own terms as spirituality led to changing definitions of science, further illuminating instances of porous boundaries as definitions of religion transform and then are connected to modified definitions of science. In this sense, we provide further empirical support and breadth to ideas about the fluidity of the knowledge category of science as well as that of religion.

Most broadly we can best understand these particular empirical findings through a broader understanding of what constitutes religious change in different ways than linear theories of secularization might purport. Linear forms of secularization would lead us to believe that science increases while religion decreases. If—as we do—we are to see scientists at elite universities as representative actors of the institution of science itself, then our findings bring a more complicated understanding of religious change at the institutional level as appropriated through the lives of key institutional actors. The very nature of movements that become institutionalized involves the presence of multiple ideologies that may even contradict one another and that operate on multiple levels and in multiple forms (Wuthnow 1987). The importance of our research lies in advancing the understanding of the nature of science and religion as institutions that maintain life through the agency of actors who adopt, adjust, and create various ideological forms within those institutions.

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