

Education on Religion-and-Science: Attitudes and Ideas

with *Tonie L. Stolberg*, "Student Thinking when Studying Science-and-Religion"; and *Jacek Tomczyk and Grzegorz Bugajak*, "On Evolution and Creation: Problem Solved? The Polish Example"

STUDENT THINKING WHEN STUDYING SCIENCE- AND-RELIGION

by *Tonie L. Stolberg*

Abstract. Thirteen theology/religious studies students were interviewed while studying science-and-religion courses at four different institutions of higher education in the United Kingdom. They held a range of views about science and religion, their respective ontological status, and their science-and-religion studies. The interviews reveal that it may be possible to assign individuals to one of four different religioscientific conceptual frameworks and, furthermore, to relate differences in their approach when studying science-and-religion to their conceptual framework. The implications for course designers are discussed, including how the frameworks may enable teachers to be more aware of the range of possible reactions students may have while being introduced to science-and-religion topics.

Keywords: conceptual frameworks; course design; education; learning; student; teaching

Interdisciplinary courses on science and religion have been offered to students studying theology or religious studies in a few institutions in the United Kingdom for several years. However, recently there has been a significant increase in the number of courses dedicated to this area of study, and there is now considerable scope for research into patterns of learning and teaching. Recent work in this area has found that institutions that

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deliver courses in science and religion assume that mutual conversation is possible (Fulljames and Stolberg 2000). Indeed, Geoffrey Cantor and Chris Kenny (2001) suggest that dialogue is not only assumed by teachers but is the inevitable outcome because the learning and teaching of courses takes place within an already prescribed framework, delineated by, perhaps, a core course text, or the label given to the relationship.¹ The text examined by Cantor and Kenny is Ian Barbour's influential book *Religion in an Age of Science* (1990). The text and his taxonomy were referred to by all of the courses taking part in this study and were specifically singled out by many of our student interviewees as a way of describing and understanding the science-religion relationship. What needs to be appreciated is that the nature of the assumed dialogue differs markedly between courses. Some courses aim to show that there can be consonance between science and religion, others argue for a greater degree of interaction perhaps in different ways for different issues, which we describe as correlation, and others are working toward the more systematic interaction of assimilation. Not known is whether the participating students share the same expectations as their tutors as to the nature of the dialogue or the nature of the assumptions they use when learning.

Theology/religious studies students are not known for being scientifically minded, and some may even espouse beliefs that are alienated from the scientific orthodoxy (Keranto 2001; Lake 2005). The aim of educators is to develop practices that enable students to reflect on what actually informs their own understanding when studying science-and-religion rather than transmitting information that may be accepted verbally but is never completely adopted (Hubbard and Abell 2005). An understanding of the conceptual framework based on both religious and scientific attitudes should provide insight into a frame of reference that has been shown to affect an individual's reasoning (Roth and Alexander 1997; Cobern 2000a, b).

Attempts to rationally delineate what lies behind observed attitudes toward learning about science-and-religion have met with difficulty. Personal views are necessarily complex and may lack the internal consistency the researcher hopes to identify. "Teachers" may not always behave as such, with their views stubbornly refusing to fit into a clearly defined box separate and identifiably different from that of their "students" (Fysh and Lucas 1998), or ideas that may be viewed as congenial and trustworthy by an individual may seem paradoxical or even self-contradictory to an outside observer (Jackson et al. 1995).

The majority of previous research has focused on the impact of an individual's beliefs on the acceptance or otherwise of the concepts underpinning the teaching of the science curriculum. This has been the particular focus of researchers in the United States, because the secularization of the American school curriculum precludes the study of the interaction of scientific conceptual development and a student's religious education. Ter-

tiary-level educational studies have focused on the impact of individuals' religious beliefs on their acceptance of standard scientific theoretical models such as biological evolution (Cobern 1994; Smith 1994; Ayala 2000), or how their belief system shapes their understanding of the nature of science in general (Brazelton et al. 1999) or particular areas of scientific understanding such as astronomy (Brickhouse et al. 2000; 2002; Shipman et al. 2002). Even a student's future career choice (Esbenshade 1993) has been analyzed in terms of its potential impact on future science-education strategies and the likelihood of changes in public perceptions with regard to science policy decisions such as those surrounding environmental issues (Petersen 1997).

Work in countries having educational environments different from that found in the United States nevertheless has focused on very similar issues. Even where *religion* refers to public and personal dimensions of Islamic faith, in contrast to the broadly Christian context of students in the majority of research, the focus is on how science education is influenced by the prevailing socioreligious context (Anees 1995; Loo 1999; 2001).

Even more limited is research that focuses specifically on the learning and teaching of science-and-religion as an interdisciplinary area with its own pedagogical issues and concerns. Even *Zygon*, which has carried articles focusing on particular topics for study in its section "The Teachers' File," rarely carries studies in pedagogy. A welcome exception was Joyce Nyhof-Young's (2000) examination of how classroom discourse might be improved by the adoption of feminist teaching tools.

Recently, however, Peter Fulljames and I undertook a major review of the teaching and learning of science-and-religion taking place in higher education institutions in the United Kingdom (Stolberg and Fulljames 2003). We assessed whether the typology for ways of relating science and religion used previously to compare the approaches of different course designers and teachers (Fulljames and Stolberg 2000) could be used to interpret the views of learners. We found that the assumption by course designers that dialogue is the preferred state of intellectual exchange is shared by many of their students but is not the only pattern of interaction that they might use. In some instances a notion of conflict was also appropriate, even though the view of science described as scientism was not prominent among the students. We also showed that different students use different ways of accommodating scientific and religious ways of thinking for different issues. Teaching therefore has to be appropriate and individualized to allow for the variety of conceptual positions held by students. Teaching and learning are more effective if the conceptual frameworks being used are understood and are identifiable. This is as applicable to teachers as it is to their students.

More recently (Stolberg 2007) I explored whether the views of teachers and their approach to teaching of science may be interpreted in terms of

the religioscientific conceptual frameworks used in thinking about science and religion and life as a whole. I found that teachers hold a range of views about science and religion and their ontological status and therefore differ in the makeup of an individual's religioscientific framework. If a teacher's attitude to science-and-religion had an "epistemic" dimension, it was integral in shaping the individual's whole thinking, not just when considering unambiguously scientific or religious issues but also their morals and values. However, if their attitude was "pragmatic," science and/or religion was viewed as very successful and an important tool for humanity to solve problems and improve its well-being.

If two similar dimensions are constructed for an individual's religious and scientific frames of mind and drawn orthogonally (see Figure 1), a point on this two-dimensional scale represents an individual's religioscientific framework. An individual positioned in the upper left quadrant (epistemic religion, pragmatic science) would be using a conceptual framework in which science and religion are kept separate; religious commitment is strong and vital, and although science's importance is acknowledged, its role is to help us technically and to solve problems. An individual using a conceptual framework in the upper right quadrant (epistemic religion, epistemic science) is likely to find scientific and religious epistemic integration an agreeable prospect, and for some, possibly based on a unified worldview, religious and scientific ways of thinking will have equal importance. For this individual science and religion both are valuable means to acquiring a deeper and richer appreciation of the physical and material

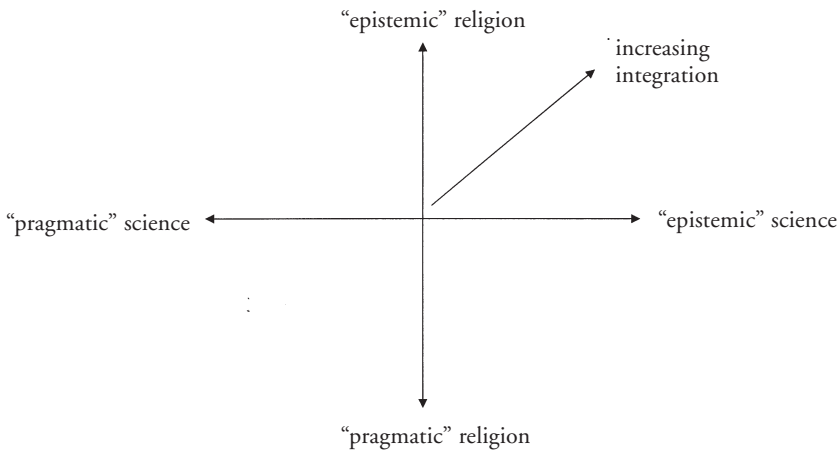


Fig. 1. Religioscientific conceptual frameworks as points on a two-dimensional scale of "pragmatic" versus "epistemic" views of the role of science and religion (Stolberg 2007).

world, each being one of the possible ways of exploring metaphysical issues and so the source of potentially life-changing or life-enhancing insights.

Dana L. Zeidler and colleagues (2002) found differences in the extent to which students compartmentalized scientific knowledge versus personal knowledge and opinion. Although certain students viewed scientific knowledge as that which is supported by concrete evidence and facts, Zeidler found that they would not consider using scientific evidence to persuade other people to change their personal opinions. This would chime with a pragmatic religion–pragmatic science conceptual framework (lower left quadrant) in which science and religious knowledge and understanding are of little personal significance.

For individuals who use a pragmatic religion–epistemic science conceptual framework (lower right quadrant), this arms-length attitude would be anathema, because they see scientific knowledge and skills as essential in allowing an individual to make informed life-choices, no matter their religious or cultural heritage.

The aim of this essay is to use the religioscientific frameworks outlined in my recent research to assess the ways of relating science and religion used by students studying science-and-religion and the possible implications for course designers.

INTERVIEWS, PROCEDURES, AND ANALYSIS

Participants in this study were undergraduate theology or religion-studies students enrolled in science-and-religion courses. With the permission of their tutors, semi-structured interviews were conducted with thirteen students in four different institutions of higher education in the United Kingdom. The students were selected on the basis of their willingness to be interviewed and the practicability of arranging interviews. Eight of the interviewees were female and seven male. Three of them indicated having studied science to a higher than basic level, achieving a post-16 level qualification.

Interview questions explored further the areas investigated in Stolberg and Fulljames 2003—the way the participants related science and religion and the impact of their religioscientific framework on their everyday lives. The first two questions² explored the extent of interviewees' formal science education, the importance of science in their everyday lives, and changes in their views of the nature of science as they participated in a course on science and religion. The next two questions³ invited discussion of religious issues that might be added to a course on science and religion or to which science would be irrelevant, in order to explore the views of learners about different ways of relating science and religion. Further consideration of such ways was possible in response to two final questions⁴ asking how

views might have been influenced or changed. These open-ended questions encouraged learners to refer to their conceptual frameworks and how they might have changed, allowing for the possibility that responses to earlier questions might also be interpreted in terms of conceptual frameworks.

I conducted the interviews in groups, each student having the opportunity to respond to each of the questions in the schedule if he or she wished to do so. Confidentiality and anonymity were emphasized. I explained that pseudonyms would be used in reports of the research. The interviews were recorded and at a later date transcribed. I used standard procedures in the analysis of the qualitative data and included both literal and interpretative reading of the data.

RESULTS AND DISCUSSION

1. Epistemic Religion—Epistemic Science Frameworks. Four of the students interviewed—Karin, Jo, Ed, and Mary—appeared to use an epistemic religion—epistemic science framework. However, there was variation in the level of distinctiveness given to the two epistemic strands and thus the degree of integration possible.

For Karin and Jo, there are very distinctive ways to gather meaning toward answering the same questions.

KARIN: The two approaches are different, but an individual can put on either pair of spectacles and see it either way—to get a complementary understanding.

JO: I do tend to use both ways of thinking to find my way around—trying to work out answers to the questions of life. . . . Everyone has a hunger to know basic questions—Why are we here?—You answer them at different levels, but they are interlinked in science and religion.

For Ed, the task for an individual is to negotiate a way forward balancing the apparent tensions between these sometimes competing influences. This is illustrated in his view on genetic manipulation. (Note: interviewer's comments are in italics.)

ED: The scientist in me says this is a grand idea—excellent stuff. The faith side of me says we should tread carefully, and I think that within myself, I seek a balance. . . . We're tinkering and, if we don't take the co-creationists' view, that God created what we have, do we have the right? Should we be tinkering in that very basic way? *You said that you wanted to "balance" the two. What is doing the balancing?* The balancing is coming from the information I get from my faith really, I do believe in God and I believe in a God who is a very caring and loving Creator and wants us to have the best out of this life.

For Mary there is no such tension as there is a great deal of harmony between her scientific and religious epistemologies. For her they do ultimately diverge, but which has the greater authority is ambiguous.

MARY: In general, the religious and scientific thinking are very close. The scientists will try to answer the questions why and will go deeper and deeper—particularly focusing on astronomy and physics—they get to the stage when, if they are a religious person, then their religion will take over, but it's not a big distinction, it's a gradual thing, whereas the Dawkinses of this world who are definitely atheists, what takes over is their atheism!

Because these four interviewees were using an epistemic religion–epistemic science conceptual framework, one would assume that their instinctive approach to the study of science-and-religion was at the very least based on the assumption that dialogue would be the natural position to take. However, the degree of distinctiveness students assigned to scientific and religious ways to knowing also influenced their approach to their studies.

Even though Karin acknowledges the differences in scientific and religious ways of knowing, she sees merit in exploring science-and-religion issues and welcomes a greater dialogue. She is therefore dismayed by the intransigence she has encountered in some of the authors she has studied in the preservation of an ignominious artificial divide.

KARIN: Both scientists and spiritualists can have an arrogant element that this is the canon that we go by, this is what we believe. But if either scientists or theologians were more empirical, which you could use for the theologians as well as the scientists, then you would get that less and you would get a more humane outlook from both sides. . . . I do think it's rather sad that on both sides of this divide, when you do get de Chardin or, on the other side, the scientist, trying to bridge the gap they're disparaged by people—if they're scientists by the other scientists, if they're theologians by the other theologians—they don't seem to like people trying to stem the divide, they feel that they're letting the side down, which is a shame really. *Why is it a shame?* I think it must be good to increase the dialogue rather than keep in separate camps all the time. *What's to be gained?* Well, understanding for a start, the other way of thinking.

For Jo, scientific and religious enquiry occupy different “realms,” so although dialogue is the desirable approach, the perceived distinctiveness in the answers received from scientific and religious enquiry are difficult for her to resolve, and dissatisfaction when studying science-and-religion seems inevitable.

JO: My mind is quite open to scientific answers and to philosophical ones and I want to put them together and get a big base and pick out the one. . . . What can I say that's for real? What's the point of studying this sort of stuff, because we're never going to find a 100 percent answer. . . . You can never come up with 100 percent evidence, and even some of the strongest Christians will have doubts and some of the best scientists get it wrong. They can say, factually, “That's definitely true,” and then a hundred years later we find they were wrong.

In contrast to Jo, Ed's “balancing” is less precarious and more assured through his study of a range of scientific and religious issues.

ED: Coming into contact with a variety of different theological viewpoints on a similar subject widens your perspective. So whilst I have not changed my stance,

my position on things is probably better informed than it was, and it has opened me up a bit more and to listen to the critiques of my position than I previously would have done. . . . I can use those differing angles in what I do now, as I am a Reader and quite involved in pastoral work—having awareness informs your discussions.

Mary's already highly integrated approach has been enriched by her studies as she finds more and stronger connections.

MARY: It has deepened things. . . . It's lovely to have the time to think about such things.

2. *Epistemic Religion—Pragmatic Science Frameworks.* For five of the interviewees—Chantelle, Dan, Chris, Aimee, and Michael—the role and limits of scientific knowledge are clear and well defined. It is for understanding the external world, not for informing internal, personal matters.

CHANTELLE: Scientific thinking goes on the basis of how you think something works. However, if you think religiously, it's consulting God and having God and his will in the picture. Religious thinking is from within the heart and applies to everyday life. When you're searching for something or trying to figure out something, you have to use your scientific antennae.

DAN: Everyday events—I would probably turn to science to say why that's happening, but for anything of a more spiritual nature, rather than seeking science for an explanation initially, I would probably satisfy myself with my faith.

For Chris, Aimee, and Michael, the relative, personal utility of scientific and religious enquiry is distinguished by an appreciation of their limitations.

CHRIS: If something can be done tangibly, then obviously, if I could use an empirical science I would, but if it is something that's not tangible, then it's "up here," or it's thinking about something, I think religion.

AIMEE: In a way religious faith can be more reliable than science—it's almost instinctive. You can't run your life by science, decisions you make are so much about how you feel—personal feelings in terms of morality—that's closer to religious thinking, which is about morality and the oneness of God, our attitude to other people.

MICHAEL: There are certain boundaries where science can't cross where science has to stop and religion or Christianity or the Bible carries on.

Thus when studying science-and-religion, scientific enquiry is unable to say anything about religious or theological practice; its role is not to challenge but rather to inform the investigator of issues that are open to differing religious or theological interpretations.

Those who use this conceptual framework find that the focus on science-and-religion makes them able to identify the differences between attitudes similar and contrary to their own. Dan's view is typical.

DAN: The course pushes you to clarify your thoughts and your opinions and why you hold that view. . . . I found myself always working not to, “Do I side with this person, or this person?” but “Where am I?” Certainly for the science side of things, I found myself having to learn the basic concepts and facts, but once I’d done that then I was able to bring those scientific facts I’d just learnt and the religious knowledge I already had, bring them together, and then I was able to progress and work forward and think, “Well, where do I stand?”

For Michael, what he has learned has not only reassured him; it also can be used to promote his religious position when in discussions with others.

MICHAEL: It’s served to clarify things for me even more. . . . I come away realizing that actually what I believe and what I’ve been taught before I came here has an actual basis and isn’t irrational, and isn’t something I’ve just been spoon fed, it’s got a strong academic basis. . . . I use science apologetically—that’s the way I work—because of my outlook on life, I want to pass on what I believe and tell people about that and explain to them and show them that it is rational way of thinking—it’s not irrational to believe in God, it does work and does fit in with life as we know it.

3. *Pragmatic Religion–Epistemic Science Framework.* Only one of the students interviewed seems to use this framework. For Karyn, science gives her the necessary life-tools for rational independent thinking and decision making.

KARYN: I’m a physicist at heart, religion is just a hobby—physics is what I am. *What makes you ‘a scientist at heart’?* I just see things and I automatically turn to thinking about their scientific explanation and proofs—I look for scientific proofs in nonscientific areas.

Karyn’s religious understanding enables her to appreciate her own religious and cultural heritage, and her study of science-and-religion is part of this general education. None of these shakes her “faith” in the scientific enterprise.

KARYN: I’m a good “Southern gal,” I grew up in the U. S. Bible Belt with people who were either nonreligious or took a very literalistic view of the Bible. So the theological interpretations used in this class have introduced me to perfectly valid other ways of interpreting the Bible. . . . It seems that science ought to tell you “yes” or “no” and it doesn’t, which is just frustrating, but it makes it fun to do research and to think about, but I think there is a certainty and, yes, science ought to discover that certainty. . . . One of my tutors argued that science is a religion—there’s no difference between science and these other religions where the layman just accepts what others say and you don’t really understand the deep theories behind it, and you’re working from a metaphysical understanding of the world that’s essentially unproven—it’s made me see that science is a religion and that you’re accepting it’s based largely on faith—faith in Einstein and Newton.

4. *Pragmatic Religion–Pragmatic Science Frameworks.* Three of the interviewees, Andy, Catrina, and Christina, can be identified as using this framework.

For Andy, both science and religion are sets of facts and skills one has to know about rather than learn from—an attitude that he carries into his approach to the study of science-and-religion.

ANDY: I don't think science has been practical or useful in anything I've done, really—apart from answering questions at pub quizzes and how to make my stereo work louder. . . . I think that science is quite like a religion anyway, as nothing is definite. Science is still a belief in what you have done.

This purely objective approach to the subject matter is also shared by Catrina—a worthwhile and interesting academic exercise, something for scientists and theologians to argue about but of no personal importance.

CATRINA: I think it's okay for theologians to have a go at science, but when scientists bring up any theological issues, they always seem to me to be questioned. I don't know why that is. People say that scientists don't have the religious knowledge, but theologians who don't have any scientific knowledge voice their opinion. . . . I'm actually here because I want to do it, but also these other influences and issues we're looking at actually makes you respect the subject more than I did when I was younger. I respect it more now, because it's such a broad topic, I never knew that so many scientific topics have theological issues.

For Christina, religious and scientific understandings both are useful for probing the diverse nature of peoples and the physical world they inhabit. This pragmatism is reflected in her approach to science-and-religion studies, which focuses on the utility of scientific and religious enquiry.

CHRISTINA: I'm also doing psychology and it correlates to how the body works in psychology and made me think about theology as well and how it relates. I've done more science but religion is more "humane"—it gives you value.

CONCLUSIONS AND IMPLICATIONS

It would appear to be possible to assign each of the students interviewed to one of the religioscientific conceptual frameworks and, furthermore, to relate differences in their approach when studying science-and-religion to their conceptual framework. The implications for the design of science-and-religion courses are significant. Course designers need to be aware of the personal religioscientific conceptual framework that, in part, governs students' and their own approaches to the teaching of science-and-religion (Nyhof-Young 2000; Fulljames and Stolberg 2000). Many students will have a strong sense of the context of their own beliefs and attitudes in relation to science-and-religion (Jackson et al. 1995). Two students may have obviously diametrically opposed attitudes, such as Michael and Karyn. For others, such as Ed and Mary, differences may be much more subtle and their resulting responses to a science-and-religion course much more nuanced.

Student attitudes may well be based on ideas that have become familiar or trustworthy, and any new ideas introduced as part of a science-and-

religion program may elicit one of two possible defensive reactions: the recontextualization of their learning to suit their predispositions (Cobern 1993) or heightened skepticism of any new approach as it is seen as an attempt at indoctrination (Jackson et al. 1995; Roth and Alexander 1997; Shipman et al. 2002). Course designers need to be responsive to the diverse nature of the approaches their students will bring to studying science-and-religion. How can science-and-religion topics be delivered in a way to effect educational change in the conceptual frameworks being used by the students? How can teaching practices be differentiated to accommodate students who are beginning their study of science-and-religion with differing expectations? An understanding of students' religio-scientific conceptual frameworks may lead to a coherent pedagogical framework for science-and-religion teaching.

NOTES

1. As Cantor and Kenny also observe, I am open to the charge that by using the label "science and religion" this research presumes that the learning and teaching of the science-religion relationship must be judged by the relative success or failure of students in constructively interrelating science and religion. Although I do not assess students' attempts to undertake this conceptual task, the main focus of this essay is the applicability of identifying the religio-conceptual frameworks being used by students and how this understanding may enable the development of a coherent pedagogical framework for the learning and teaching of science-and-religion.

2. Question 1: "Looking back at your formal science education, what relevance does it play in your life today? Can you describe a specific example?" Question 2: "Is the science you studied as part of this module different? In what way? Can you describe a specific example? Why do you think that is?"

3. Question 3: "What are the other religious issues, not covered by the course, for which science has something valid to say? Why?" Question 4: "Are there any religious issues where an input from science or scientists would be irrelevant? Why?"

4. Question 5: "How does scientific thinking or religious thinking influence your views? Do you ever bring both ways of thinking to bear on the same issue?" Question 6: "Can you give an example as to how the course has altered, if at all, your religious views in any way? In what way has this course affected your view on broader religious issues?"

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