BARBOUR'S FOURFOLD WAY: PROBLEMS WITH HIS TAXONOMY OF SCIENCE-RELIGION RELATIONSHIPS

by Geoffrey Cantor and Chris Kenny

Abstract. In this paper several problems are raised concerning Ian Barbour's four ways of interrelating science and religion—*Conflict*, *Independence*, *Dialogue*, and *Integration*—as put forward in such publications as his highly influential *Religion in an Age of Science* (1990) and widely adopted by other writers in this field. The authors argue that this taxonomy is not very useful or analytically helpful, especially to historians seeking to understand past engagements between science and religion.

Keywords: Ian Barbour; conflict; dialogue; independence; integration; science-religion relationship.

THE CONTINUING DOMINANCE OF *CONFLICT*

Ian Barbour is probably the most widely cited author in the area of science and religion—and with good reason, since his several books, but especially his *Religion in an Age of Science* (Barbour 1990; revised as Barbour 1997), offer a sophisticated overview of the field. He possesses a deep sympathy for the topic; he is widely read; he writes well and leads the reader gently through the many intricacies of the subject. He is not dogmatic but can appreciate both the strengths and weaknesses of other people's positions. His writings on science and religion thus provide the reader with a privileged understanding of these knotted strands in the history of Western thought and of the many positions that have been adopted. It may therefore seem ungenerous to criticize one specific aspect of Barbour's work,

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[*Zygon*, vol. 36, no. 4 (December 2001).]
 ISSN 0591-2385

but there is, we believe, a problem that needs to be addressed that seems particularly relevant to us as historians of science. It arises most explicitly in the chapter in which Barbour analyzes the "Ways of Relating Science and Religion." Here he identifies four ways in which science and religion have been and continue to be interrelated: *Conflict*, *Independence*, *Dialogue*, and *Integration*. The exposition of these four relationships doubtless constitutes the best-known part of Barbour's book, and they have been repeated and occasionally revised by other authors.[1] In this essay we analyze Barbour's taxonomy and determine its usefulness.

Barbour explains at the outset that he is proposing his fourfold taxonomy in order "to give a systematic overview of the main options today" (1997, 77). The first point to notice is that these are the only viable alternatives—the only shows in town—and they must therefore cover all cases. Although his emphasis is presentist and most of his examples are drawn from recent commentators, he considers his classification applicable to earlier periods. Thus, not surprisingly, his section on Conflict opens with reference to the well-known conflicts surrounding Galileo and Darwin. Hence, his overarching fourfold taxonomy functions as a metathesis specifying all possible science-religion interrelationships. Yet Barbour appreciates that none of his four positions is simple and monochromatic, but each covers a number of distinct theses. Thus Dialogue encompasses a "diverse group of views" among which he identifies three cases: (1) where science and religion share suppositions in common, (2) where methodological parallels exist, and (3) what he calls "nature-centred spirituality" (Barbour 1997, 90–98).

In the context of his *Religion and Science* (1997) Barbour's four key terms not only classify the ways in which science and religion interrelate but also perform a didactic function, since there is a conceptual, historical, and developmental relation between them. Indeed, his aim in this chapter is to persuade the reader of the inadequacy of Conflict and Independence and instead to support "Dialogue and, with some qualifications, certain versions of Integration" (Barbour 1997, 77). Thus he makes his agenda explicit. We have no difficulty with this except that the unwary may not recognize that Barbour's four options incorporate certain values and commitments.[2] His argument is underpinned by the view that in the science-religion domain there is an inexorable progress from Conflict, through Independence, to Dialogue and Integration. Indeed, during this final stage science and religion converge and become increasingly indistinguishable—as indicated in figure 3b. We need to be clear about this dynamic and how it functions.

Barbour starts with Conflict. We should note that *conflict* possesses an interesting and relevant history, as its entry in the *Oxford English Dictionary* shows. Early uses of the term were confined to battles and collisions—for example, between two bodies. The word also took on various

figurative meanings, in particular the mental or spiritual struggle within an individual. A new shade of meaning arose at about the time of publication of the main source for the conflict thesis—John William Draper's *History of the Conflict between Science and Religion* (1874). According to the *Oxford English Dictionary*, *conflict* now came to mean the "clashing or variance of opposed principles, statements, arguments, etc."—a figurative meaning attributed to Benjamin Jowett writing in 1875.

The preceding analysis is confirmed by examining books with *conflict* in their titles.[3] Beginning in the late sixteenth century, numerous works addressed the spiritual battles waged by the Christian, such as John Downame's *The Conflict betweene the Flesh and the Spirit* (1618) or F. D. Maurice's *The Conflict of Good and Evil in Our Day* (1865). By contrast, a relatively small number of books dealt with armed conflict, most of which related to the American Civil War with titles like *The American Conflict* (Greeley 1865). Draper, it should be noted, was an American who wrote a three-volume *History of the American Civil War* (Draper 1868–70), which chronicled another "preordained and necessary" conflict between two systems of ideas, only a few years before his *History of the Conflict between Science and Religion* was published (Lindberg and Numbers 1986, 1–18). However, with a couple of questionable exceptions, Draper's later book was the first to use the word *conflict* in its title to express a battle between religious, political, or philosophical opinions. Over the next decade, several other authors adopted similar titles to encapsulate opposing positions, such as *The Conflict between Labor and Capital* (Bolles 1876), *The Conflict of Christianity with Heathenism* (Ropes, Smyth, and Uhlhorn 1879)—a history of the early church—and *The Conflict between Literature and Science* (Tilden 1881).

One implication of this discussion is that only in the mid-Victorian period did the word *conflict* assume the connotation we associate with the conflict thesis. Thus, not only was Draper's book the main source of this thesis, but at about the same time *conflict* adopted a new layer of meaning, doubtless owing in part to Draper's deployment of the term. But a second implication is that in talking of, say, Galileo's conflict with the Church of Rome we are using a vocabulary that was not accessible to Galileo's English contemporaries and was only forged three-quarters of the way through the nineteenth century. In short, to describe the Galileo affair as an example of Barbour's Conflict involves an anachronistic use of the term. If we wish to use the term (in its modern sense) we should at least be aware that it could not have been an actors' category at any time before about 1870 and that we are imposing on history a term with a rich but highly partisan history over the past century and a third.

Returning to Barbour's account, we should note that he cites both the scientific materialist and the biblical literalist as espousing Conflict. Having criticized and disposed of both versions, he devotes the "remainder of this chapter" to exploring "alternatives. . . . One way to avoid conflicts

between science and religion is to view the two enterprises as totally independent and autonomous" (Barbour 1997, 84). Thus he ushers in *Independence*. Finding this unsatisfactory he "go[es] beyond the *Independence* model" by introducing *Dialogue* (Barbour 1997, 90). While commending many specific modes of Dialogue he finally engages *Integration* as the most acceptable position. Of the four options presented by Barbour, two are erroneous, while the other two are broadly correct. Moreover—and this is for us the important point—he enunciates a pilgrim's progress starting with Conflict, briefly engaging Independence, and finally finding haven either in Dialogue or preferably in some form of Integration.

We should also note another aspect of this dynamic. Our pilgrim starts with the familiar conflict thesis. In an important sense the other three positions are developed out of criticism of that foundational thesis. To put the matter another way, although ultimately rejected, the conflict thesis has set Barbour's agenda for categorizing the ways in which science and religion interrelate. This point applies not only to Barbour but also to many other religious writers whose understanding of science-religion relationships have been forged in the furnace of their enemies (Rae, Regan, and Stonehouse 1994).

The influence of Draper and later conflict theorists has been immense, since many of those who rejected Draper's analysis were nevertheless forced to fight on the field prescribed by Draper. We are therefore particularly interested in the comments of an American Quaker, Joseph Gurney Pinkham, who in 1875 contributed an article on "Religion and Science" to the *Friends' Quarterly Examiner*. Although he characterized the situation using conventional military terminology he did so with a touch of irony:

> It cannot be denied that the present attitude of religion (perhaps I should say, of theology) and science to each other is decidedly antagonistic. We have not to look far to see the proofs of this conflict, and to ascertain its causes. The warfare is an open one. . . . [W]e see Theology, armed with the weapons she has wielded for centuries, striving to protect her sacred domain from the invasion of the iconoclastic hordes that would overrun it. (Pinkham 1875, 339)

Although Pinkham regretted the conflict, his intervention is interesting because he adds the following:

> I have thus represented in outline the field of battle, and the points around which the fight is most furious. It is now my purpose to analyze the subject a little more closely in detail, to see if in all this chaos of conflict there are not some elements of possible concord. (p. 339)

As Pinkham was a Quaker, his message was irenic. The warfare was more apparent than real. The conflict was not as total as the protagonists insisted; instead, there existed "some elements of possible concord" (p. 339).

We wish to preserve this insight of Pinkham's and recognize that not all writers of the 1870s perceived the science-religion relation as one of un-

mitigated conflict. Nevertheless, it was (and is) a position adopted by those who sought (and seek) to set science against religion. At the other extreme, some religious writers refuse to sanction conflict and attempt to show that all good science is compatible with religion. We do not condone this strategy and instead point out that many scientists (and others) perceive conflict between science and religion. Yet conflict comes in various forms, ranging from conflicts over institutionally sanctioned power to disagreements over claims about the world. But our main point is that while numerous conflicts have occurred, the conflict thesis is highly problematic as a general claim about the relationship between science and religion. However, the proponents of conflict have possessed the advantage of determining the terms of engagement—as they so often continue to do. In particular, high-profile publicists like Thomas Henry Huxley and John Tyndall framed their arguments in terms of science *versus* religion and thus forced an ontological separation. They having imposed this separation, the response of most of their religious opponents was to seek ways of predicating science and religion that would negate the conflict thesis. Thus, the opponent of Conflict is forced to adopt one or more of Barbour's other three positions—Independence, Dialogue, and Integration. In the ensuing discussion we want to show the persistent and lamentable effects of these overarching theses on discussion of the whole science-religion genre.

Terminology is of great importance in this area, and it is unfortunate that Barbour and others have adopted the term *conflict*, even though Barbour seeks to move beyond it. Not only does this term set his agenda, but it also biases our understanding by introducing language often associated either with internal religious discord or with warfare. The term has gained credence by its extensive use over the past century and a quarter (Moore 1979; Russell 1989). Yet, do we have to deploy this military metaphor framed by those who had a vested interest in portraying a battle between science and religion? What other language can be used that does not evoke conflict?

Let us start by exploring an analogous case. Assume that a scientist has produced experimental data (O) that differ from deduction (O') derived from theory T. In a purely formal sense there's a logical conflict between O and O'. O can be used to refute T. However, we need to go beyond the logic of the situation and recognize that in labeling this a conflict we admit that the line of dissension runs so deep that we have no option but to reject T in the light of O. But such naive falsificationist strategies are rarely employed. What is far more likely to happen is that scientists will perceive this not as a conflict but as a *problem* and one that they will actively seek to resolve, possibly by changing any one of a number of subsidiary assumptions. One well-known example arises from the observed non-ellipticity of Uranus's orbit. This was a problem because Newton's celestial mechanics (T) predicted that all planets, unless disturbed by extraneous forces,

will move in elliptical orbits (*O'*). However, instead of interpreting this observation (*O*) as refuting theory *T*, investigators sought a solution, and in the mid-1840s both Urbain Jean Joseph Le Verrier and John Couch Adams calculated the position of a celestial body that might be responsible for the perturbation of Uranus's orbit. Astronomers searching that area of the sky soon identified a new planet, Neptune (Smith 1989).

Despite this example being derived from science, it is typical of many disciplines, theology included. Although satisfactory solutions (however defined) will not always be found, honest researchers will try to resolve outstanding problems. Indeed, in any intellectually worthwhile activity there will be problems—some large, some small—for practitioners to solve. That problems have occurred and continue to occur in the science-religion domain is only to be expected; indeed, we would be very suspicious if no such problems appeared! In adopting the less prejudicial term *problem*—rather than *conflict*—we create a more level playing field when analyzing the science-religion domain.

We should not, however, be understood as advocating the word *problem* as the new panacea. Instead, the point of the foregoing discussion is to show that *conflict* is a historically loaded pejorative term and that in adopting it as the first of his four modalities Barbour has given too much credence to the conflict theory. Once conflict is accepted as governing the terms of engagement, alternative ways of articulating science-religion relations are necessarily skewed by being framed in opposition to conflict. The ease with which the image of conflict could take hold of the historical imagination is in part driven by the use of monolithic categories. In the next section we address the problems generated by focusing on simplistic categories and show that both Conflict and the other three stances identified by Barbour are incapable of capturing crucial aspects of science-religion interactions.

The Ubiquitous *and*

Careful attention should be paid to that oft-used, but apparently unavoidable, phrase "science *and* religion." While the definitions of *science* and of *religion* are thorny enough (Wilson 1996), we face an even greater problem in trying to determine how the copula *and* affects the meaning of this phrase.[4] The use of *and* immediately biases discussion in two ways. First, in certain contexts it takes on specific meanings. Thus, for example, it is widely assumed that anyone writing on science *and* religion (but without prefacing this by "the conflict between") will, like Barbour, have rejected the conflict thesis and championed some constructive relation between science and religion. Thus, when atheist friends hear that we are members of the Centre for Science and Religion at the University of Leeds they immediately assume that we are committed to ways of constructively in-

terrelating science and religion. In other words, in the context of common discourse the copula is not neutral but is generally used within the well-established tradition of opposition to the conflict thesis. However, like many other historians, we would insist that the study of science-religion interrelationships must take seriously the writings of Huxley, Tyndall, Richard Dawkins, and the many other advocates of the conflict thesis. In other words, contrary to its more conventional delimitation, the academic subject "Science and Religion" must include the study of examples of conflict.

The other main point concerning the copula *and* relates to its formal, logical use rather than its deployment in common speech. This copula identifies and circumscribes a natural domain—science and religion—in which both science and religion share common vocabularies, theory structures, methodological aims, and epistemological problems. Thus the positions that Barbour calls Dialogue and Integration presuppose forms of conceptual sharing between science and religion—as expressed in the diagrams discussed in our final section. This shared domain exists only insofar as it identifies specific elements of both science and religion while ignoring others.

Given that Barbour's taxonomy is applicable to historical settings, we should ask, In writing history what function does the conjunction "science and religion" perform? This is especially problematic, since neither science nor religion (nor the conjunction "science and religion") possesses clear historical continuity. Although we can identify common properties that can be used to define continuous scientific practice from Aristotle onwards, these categories do not exhibit either synchronically or diachronically stable boundaries in the manner of natural kinds. In spite of the unbounded and fluid extensions of the categories *science* and *religion*, many writers treat them as distinct classes with fixed, temporally independent, and self-evident meanings. This is particularly irksome for the historian of science who investigates in detail the diachronic and synchronic alterations in both the extension and the intension of these continually transforming terms. Questions about rupture and continuity are still very much alive in discussions of scientific change and likewise in determining how a historical actor's religion can be described. Even Wittgenstein's helpful notion of "family resemblance" cannot avoid the question of whether or not these two crucial terms can provide anything more than a superficial and broad brushstroke analysis. Historians of science have not succeeded in framing a universal definition of *science*, and it is now recognized that any such attempt is futile. Likewise, within the history of religions (*Religionswissenschaft*) the problem of providing a definition of *religion* has proved notoriously difficult.

In forming the construct "science *and* religion" we have at least tripled the problems of delineating the boundaries of this new set, brought into

being by means of the copula. Furthermore, in current science-and-religion studies this newly constructed category is often evoked as a shorthand for an overarching metaphysics: for example, it might be a systematic construction grounded in process theology, which deals primarily in Christian theological concepts and their putative counterparts in the fundamental theories of physics or in current cosmologies. In this instance the term *religion* is treated as a synonym for Christianity, more specifically for certain kinds of Christian theology. This leads us to ask whether the newly founded academic domain of "science and religion" is worthy of historical investigation. Perhaps we are in danger of merely projecting this artificial template onto the past and shoehorning our historical evidence to fit its contours.

In view of these general problems, it is surely unhelpful to posit a conjunction between *science* and *religion*—these two amorphous and protean terms—without a close analysis of their precise meanings within specific contexts. If we fail to acknowledge the need for this kind of localization, then the constructed categories define relationships and interactions that are merely the product of an empty conjunction. Between empty sets one can establish any number of relationships: fictional characters can engage in conflict, harmony, détente, coexistence, copulation, cohabitation, and so on. There is certainly no shortage of possible relations. As history shows, especially the history of philosophy, one can glean abundant evidence of animosity, negotiation, duplicity, and fraud—in a word, conflict. The ubiquitous presence of disagreement was a marked characteristic of what in early modern Europe became known as the Republic of Letters (Goldgar 1995). Interpersonal conflict was ubiquitous. Given the diversity of causes at work in agonistic interactions among the learned—in that or in any other period—we need to establish with some precision the parameters that apply in each particular case.

Seventeenth-century Europe—allegedly the birthplace of modern science—provides abundant evidence of confrontational encounters among the key figures engaged in developing the "new philosophy": Galileo versus Scheiner, Descartes versus More, More versus Leibniz, Hobbes versus Boyle, Leibniz versus Newton, Hooke versus Newton, Malebranche versus Arnauld, and Stillingfleet versus Locke, to name but a few. This list should warn us not to posit an overarching conflict between such general categories as traditional Aristotelianism and the radical new philosophy. Even more suspect would be the thesis that all these confrontations could be reduced to traditional religion versus the new science. Instead, these confrontations were multifaceted. Many revolved around institutional, intellectual, and priority disputes; there were arguments over the details and the legitimate provenance of metaphysics, the sufficiency of Aristotle's natural philosophy, and the precise domains of divinity and humane learning (Morgan 1986). At issue too was the legitimate extension of the various

notions of *scientia*. The resulting debates were predicated on a vast range of specific metaphysical, theological, methodological, and even nationalistic factors. All too often the protagonists cannot easily be grouped within distinct categories. In many instances disputes were not generated by conflicting systems of knowledge (such as divinity or natural philosophy), but the intensity and the extent of the conflict depended on the aims of the writers and, in particular, on the social positions of the protagonists (Grafton 1991). For example, in the debates regarding the role of human understanding and secular learning—highly pertinent to the expanding interest in natural philosophy—many writers sought to extend or curtail the power of reason and to specify its legitimate domain. The boundaries were fluid and often changed in response to the claims of opponents or were tailored for a specific audience; thus, if one controversialist was seen as placing too much emphasis on the power of reason, others who in other circumstances were quite willing to pursue and champion rational learning might strongly object (Morgan 1986). Very often the nature of scholarly disputation itself was the driving force for learned engagement, even if the actual controversies were clothed in the defense of some religious position (Champion 1992).

We suggest that conflicts such as these cannot be analyzed in terms of the interactions between broad categories—for example, between science and religion—no matter how subtly we redefine the boundaries between them. Indeed, especially in the seventeenth century, the boundaries between different forms of knowledge were very fluid and were a recurrent source of conflict. Historians recognize that these debates should not be analyzed using modern and anachronistic intellectual cartographies, because seventeenth-century maps of knowledge contained very different subject categories. *Any* systematic body of knowledge could be labeled a science. However, by the middle of the nineteenth century many writers abandoned the view that a number of distinct sciences exist, instead adopting the position, still popular today, that the sciences form a unity (united perhaps by a common methodology). Likewise, use of the term *religion* has changed; for example, only in the eighteenth century was it widely recognized that other people's beliefs could constitute religions different from one's own (Harrison 1990).

These historiographical problems, generated by loose and unhelpful categories and taxonomies, can be illustrated by one of the most notable exchanges in early modern intellectual life—that between Samuel Clarke (with Newton hovering in the background) and Leibniz (Vailati 1997). This early-eighteenth-century controversy focused on important metaphysical and theological issues and on questions of the supportive role of natural philosophy in natural religion. Since both Clarke and Leibniz invoked theological arguments and issues, can this exchange be understood through the lens of "science and religion"? Before we can consider this we must

raise two related questions: In this instance is "science *and* religion" a useful historical category? Will Barbour's fourfold system of classification prove helpful?

In the opening salvo of the Leibniz-Clarke correspondence Leibniz famously accused Newton and the "English" philosophers of materialism. This initial charge was the result of a complex structure of personal, professional, institutional, metaphysical, and nationalistic factors, all played out for the benefit of a member of the newly enthroned Hanoverian monarchy (Shapin 1981). The debate began with the claim that Newton's natural philosophy was detrimental to natural religion. But in the heat of the controversy this opening salvo was soon subsumed within a complex metaphysical dispute over the nature of God, time, space, free will, body, force, substance, and so on. Moreover, Leibniz's agenda was ultimately to portray his own metaphysical system—which attributed a central role to the immaterial via incorporeal substances—as fully supportive of natural religion. By contrast, he charged Newton and the English philosophers (especially Hobbes and Locke) with introducing notions of atoms and void that provided the main metaphysical underpinnings for materialism and therefore for atheism.

There are further complications that cannot be incorporated in simplistic taxonomies. Leibniz upheld the seventeenth-century ideal that in "physics" we should strive for mechanical explanations. However, he atypically insisted that in metaphysics mechanical explanations are insufficient and that vital or spiritual principles are required, without which physics would lack a real foundation. Newton's physics, according to Leibniz, lacked this metaphysical grounding notwithstanding his deployment of what Leibniz called "occult forces." Of course, Leibniz must have been aware that gravity for Newton was not mechanical and that Clarke utilized this nonmechanical feature as evidence of an active spiritual presence within an otherwise inert mechanical system of interacting atoms. But Leibniz strategically represented Newton's deployment of gravity as simply a God-of-the-gaps tactic—if God could be made to do everything, then it was tantamount to having a God who did nothing. The differences in the two approaches were irreconcilable, despite each side claiming that its natural philosophy and metaphysics were fully in accord with the demands of religion.

What this example shows is that two highly systematic thinkers each claimed that the other's views were providing atheism with metaphysical and physical supports, that each opponent had given a suspect account of the world. What, then, are the issues for the historian? Conflict abounded, but it is not conflict between two abstractly conceived notions of *science* and *religion*, notwithstanding the charge made by each protagonist that his opponent had subverted natural religion by means of a materialist system of natural philosophy. They constructed an apparent conflict, largely for

the benefit of an external audience, using agendas that had very little to do with the content of the debates. Irrespective of the putative conflict between natural philosophy and natural religion, any account of the actual conflict must recognize that it was played out on a much larger canvas than we usually allow when discussing "science and religion" and that the complex strategies employed by the protagonists must be understood within this more extensive framework. (Similarly, if we limit our account of a football match to the visible maneuvers on the field we are missing some of its most important determining features, such as local traditions and rivalries, the exorbitant fees being paid in the transfer market, and the pursuit of self-esteem.)

Even then the perspective of the historian is not an immaculate perception. How is the historian to interpret the choice between Leibniz's characterization of Newton's natural philosophy as inimical to natural religion and the presently received view of Newton as a prime example of a natural philosopher whose "religious commitment profoundly affected the way he thought about nature"? (Brooke and Cantor 1998, 1) By emphasizing some features and ignoring others the historian can vindicate either Leibniz's charges or Clarke's defense. However, such selectivity raises a number of problems. For example, if Newton were so concerned to reflect his religious commitment in his natural philosophy, why did he promote Epicurean atomism, which was widely recognized as a notorious system of metaphysics? Again, why is there only a single noncommittal religious reference in the first edition of the *Principia*? (Newton 1687, 415)[5] It was only after extended criticism by Leibniz and others that the famous "General Scholium" was added to the *Principia*.[6] These questions require extensive investigation, as does the history of the acceptance of atomism in the seventeenth century and its complex interactions not only with traditional Aristotelianism but also with other competing explanatory systems, such as Cartesianism. But in pursuing these investigations we move further away from—not closer to—any framework that Barbour's taxonomy of "science and religion" can provide.

Likewise, when examined closely, many of the so-called interactions between science and religion—of Galileo, Boyle, or Newton—provide evidence of other connections and negotiations that the historian is required to provide with a high degree of analytical precision. The richness of the discursive materials and the complexity of the texts ought to caution us not to seek any simple relationship between science and religion. If these are not simple entities, then they cannot have any straightforward relationship—complex or simple—and other approaches are required. In the following section we suggest that there is much to be gained from focusing on the day-to-day activities of individual agents and how they respond to contingent factors in framing their understanding of science-religion interrelations.

Levels and Complexities in Both Science and Religion

The foregoing analysis suggests another way in which Barbour's taxonomy of science-religion interrelationships falls short. We can envisage his taxonomy as a form of mapping in which both science and religion are represented by bounded regions projected onto the page. Thus *Independence* is represented by the total separation of the two regions—S[cience] and R[eligion]—neither touching nor intersecting. *Dialogue* involves some contact, perhaps along a common boundary, while with *Integration* there is significant overlap and merging. In this taxonomy science and religion are conceived as two bounded regions on the same two-dimensional surface in the same way that logical relations can be represented diagrammatically—figures 1 to 3.

Are both science and religion bounded activities? Can science-religion relations (for want of a better phrase) be restricted in this way? This mode of representation is too simple and ignores the richness and diversity of both science (perhaps sciences?) and religion (or religions?). Indeed, the extensions of each term are open to dispute. Thus, for example, although

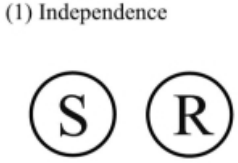

Figure 1. Independence. In Barbour's scheme *Independence* occurs if there is no contact or sharing of concepts, methods, etc. between S[cience] and R[eligion].

Figure 2. Dialogue. With *Dialogue* borrowing takes place of, say, metaphysical assumptions. The arrows indicate that this borrowing can take place in either direction.

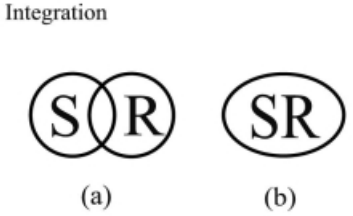

Figure 3. Integration. *Integration* involves commonality of concepts, etc. It can either be partial (a), or total (b).

Barbour appears to include only the cognitive content of religions, sociologists of religion would insist on including the rituals and social structures of religious groups. Moreover, many Christians will object to this emphasis on the cognitive, because it omits the crucial role of faith, salvation, and the revelation of such fundamental doctrines as the Trinity. Likewise, the boundary of science is notoriously difficult to define: Do we include economics and psychoanalysis within science? Should science be limited to its theories, or does it encompass the scientific methods, laboratory practices, and even the social structure of scientific communities? Relationships of Conflict, Independence, Dialogue, and Integration occur only between highly specific features of both science and religion—those that can be expressed within a closed system of propositions. Indeed, we tend to ignore all other aspects if we concentrate exclusively on these specific characteristics.

To emphasize the richness that can occur we turn to *Reconstructing Nature* (Brooke and Cantor 1998). Here the example of St. George Jackson Mivart, the nineteenth-century comparative anatomist, is cited. Mivart provides a surprising (but doubtless not unique) example because he employed all four of Barbour's stances. Was he being perverse or downright inconsistent? If we look closely at how Mivart discussed the relationships between science and religion we appreciate that he was neither perverse nor inconsistent, since in each discussion he was referring to specific, but different, aspects of both science and religion.

> [Mivart] perceived *Conflict* between the Darwinians' overstated commitment to natural selection and his understanding of the human condition in which mental and moral attributes were important but could not be explained by natural selection. Likewise he used an *Independence* strategy when arguing that the Galileo affair should teach us that science is for scientists and theology for theologians. Each had its own proper domain. Yet he also conceived a form of dialogue when arguing that both science and religion are rational activities; he insisted that neither scientists nor theologians should forsake their critical faculties. Finally, much of his own research was empowered by specific integrationist strategies. Thus he perceived the world framed by the divine architect and he directed his research to elucidating archetypes. His integrationist programme greatly inflamed Huxley and other proponents of scientific naturalism. (Brooke and Cantor 1998, 276)

This example shows how an individual can and often does make use of a variety of different arguments. Yet this very diversity and complexity casts doubt on the usefulness of trying to capture the contingent and changing relations between science and religion by an essentialist taxonomy. Indeed, in opposition to Barbour's position we would argue that the individual must be treated as an active agent who deploys different strategies creatively. In the case of Mivart, who was desperately trying to maintain his participation in both science and Catholicism in the face of determined opposition from both communities, much creativity was required. He can be understood not as exemplifying any single essentialist position but as

actively constructing his understanding of the mutual bearings of science and religion at a specific time and place.

Barbour might appear to cover this possibility when he writes: "Particular authors may not fall neatly under one heading; a person may agree with adherents of a given position on some issues but not on others" (Barbour 1997, 77). However, he clearly did not envisage such examples as Mivart, who, by spanning all four positions, implicitly challenges the very project of confining science-religion relationships under Barbour's four stances. Barbour's taxonomy is thereby rendered unhelpful, if not totally untenable.

From the foregoing discussion of Mivart it is clear that the static maplike relationships that Barbour envisages are inadequate to portray the dynamic engagement between science and religion. How Mivart portrayed science-religion interrelations was dependent on the context, both intellectual and social. He differentiated between the science of the Darwinian faction and his own scientific view; again, he differentiated between what he perceived as the reactionary Catholicism of the Roman leadership and his own more liberal viewpoint. With these distinctions in mind, neither science nor religion can be conceived in the abstract as single or bounded. Instead, we have to pay close attention to the speaker and which aspects of science and religion are being evoked. In other words, we must understand the context.

A related point emerges if we move our focus away from science and religion (both) in the abstract and appreciate how people negotiate the issues. Thus, we should see Mivart as behaving strategically—tactically might be a better word—in that he was not passively contemplating the interaction between science and religion but rather, as a liberal Catholic and professor of comparative anatomy, responding to what he saw as the antiscientific attitudes of the Catholic hierarchy and the antireligious ethos of the Darwin circle.

This argument shows that Barbour's four types of science-religion relationship are not fundamental but are highly localized constructions. It is like classifying a number of objects according to shape when the physically relevant parameter is color. Thus *Conflict* is not an illuminating term unless we look to the social, political, and religious forces—that is, historical forces—that lie behind specific articulations of the claim that science and religion stand in opposition. As Barbour rightly realizes, scientific materialists and biblical literalists are among the main articulators of the Conflict thesis (Barbour 1997, 78–84). However, his emphasis on the Conflict relationship obscures the historical dynamics that have fueled both materialism and biblical literalism. These need to be investigated if we are to understand why these groups propounded an ideology of conflict.

Another concern, which would require a separate paper, is that since Barbour's discussion is directed to Christianity, it may not be applicable to other religious traditions. As anthropologists and sociologists of religion have emphasized, Christianity is perhaps atypical in that it places so much

emphasis on both theology and belief. Many other religions, including Buddhism and Judaism, do not share these characteristics. Moreover, even some branches of Christianity, such as Quakerism, which was forged as a reaction to mainstream Anglicanism, reject systematic theology and place far greater emphasis on religious practice than on belief. Barbour's scheme, therefore, lacks broad applicability.[7]

In contrast to Barbour's attempt to construct both science and religion as categories abstracted from historical dynamics, we suggest that the individual human life—i.e., biography—can provide a major locus for studying science-religion interactions (Brooke and Cantor 1998, 247–81). Biography asks us to appreciate the twists and turns of a maturing individual as the mental and spiritual life develops through engaging different influences—physical, social, and religious. The crucial point is the contrast between the experience of the biographical subject with the abstracted domains of science and of religion as so frequently portrayed by writers on this topic, Barbour included. While science and religion may inhabit different buildings on a university campus and be shelved in different parts of the library, the individual is unlikely to encounter them so neatly and distinctly packaged. Some form of religion (broadly defined) may enter the child's consciousness through the family situation and become confirmed, undermined, and modified over the years. Science, particularly in its more sophisticated forms, usually only begins to impinge during the mid-teens. A person's experience of both science and religion is likely to develop in a fairly piecemeal manner. Particularly if the person is strongly drawn to one, or the other, or both, the inputs are likely to impinge with intensity. Reading a book by Dawkins, hearing a sermon, witnessing the death of a close relative—all these and many other experiences may profoundly affect our biographical subject. Only on rare occasions will the individual perceive science-and-religion as a choice between the four essentialist relationships that Barbour postulates. While there are certainly other legitimate approaches, the study and writing of biography can produce a sophisticated understanding of science-religion relationships and provide a strong argument against accepting Barbour's fourfold way.

NOTES

The authors express their sincere appreciation to John Hedley Brooke, David Cantor, Peter Denton, Tamar Rudavsky, Jacqui Stewart, Jonathan Topham, and David B. Wilson—all of whom have contributed constructively to their reflections on this subject.

1. See, for example, Haught 1995. Barbour's fourfold taxonomy is repeated in his latest book (Barbour 2000). See also the helpful discussion of taxonomies by Willem B. Drees (1996, 43–44).

2. Taxonomies invariably incorporate values. For example, if I sort the books on my desk according to date of publication, I am not choosing some arbitrary parameter; instead, my decision to create a chronological sequence may be informed by a commitment to progress in, say, the development of the bicycle. By ordering the pictures of bicycles contained in these books according to date I intend to show how the penny-farthing evolved into the modern racing bicycle (Hacking 1996, 37–74, especially his discussion of the "*taxonomic* thesis," 47–49).

3. The formal conflict between the English and Scottish legal systems also accounts for several nineteenth-century titles.
4. As Ian Hacking points out, even the use of the term *sciences* at least acknowledges the disunity that is crucially important in establishing relationships of the sciences with any other body of knowledge (Hacking 1996).
5. Here Newton argued that God had placed the planets in their respective orbits so that they would receive heat from the sun in proportion to their densities. This passage was removed in the second (1713) edition.
6. The "General Scholium" was emended in Newton 1713. For relevance of Leibniz's criticisms to these changes, see Cohen 1978, 152–56 and 240–45.
7. See, for example, Malcolm Ruel's argument that among world religions only Christianity places so much emphasis on belief (Ruel 1997, 36–59). An interesting example taken from Jewish history that fits Ruel's thesis is Fisch 1997.

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