

THE CONTINUING INTERACTION OF SCIENCE AND RELIGION

by John Polkinghorne

Abstract. Stephen J. Gould's notion of non-overlapping magisteria (NOMA) is neither experientially supported nor rationally justifiable. Influence flows between science and religion, as when evolutionary thinking encouraged theology to adopt a kenotic view of the Creator's act of allowing creatures to be and to make themselves. Alleged simplistic dichotomies between science and religion, such as motivated belief contrasted with fideistic assertion, are seen to be false. Promising topics in the currently vigorous dialogue between science and religion include relational ontology, eschatological credibility, and ethical issues relating to advances in human genetics.

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One can rely on Tertullian to provide a strikingly expressed, if occasionally ill-judged, phrase as a peg on which to hang a discussion. John Caiazza (2005) invokes the notorious question "What has Athens to do with Jerusalem?" as the starter for his account of the contemporary relationship between religion and culture (in particular, science). The obvious answer to Tertullian is "Quite a lot," for one can readily argue that the spiritual and intellectual life of the West has been decisively molded by the interacting influences of both of those two ancient cities.

The history of Christian thought illustrates the point. At its best, theology has always sought to incorporate the valid insights of secular knowledge into its profound and integrated account of the created world. Ultimately knowledge is one because God, the ground of all that is, is One. In the interaction between theology and other forms of rational

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inquiry, the aim of the religious thinker should be to benefit from secular insight and discovery but to do so without capitulating to any illegitimate attempt to impose an a-theistic protocol upon the resulting form of understanding and without ceasing to affirm the power and validity of intrinsically religious knowledge and experience. When Augustine interacted with the neo-Platonism of his day, he did not hesitate to modify its ideas, particularly in the light of his Christian belief in the Word made *flesh*. When Thomas Aquinas made use of the newly recovered insights of Aristotle in framing his doctrinal *Summa*, he felt free to not accept that philosopher's belief in the eternity of the world. It seems to me that those active today in the continuing dialogue between science and theology exhibit a similar openness to new knowledge and new ways of thought while refusing to collude with the metascientific assumptions of an imperialist secularism that seeks to assert science as the only source of worthwhile knowledge.

This means that virtually all of us engaged in this dialogue reject the offer of a false truce, proffered by Stephen J. Gould (1999) through his concept of "non-overlapping magisteria" (NOMA). As Caiazza notes (2005, 12), Gould's idea is at least as old as Siger de Brabant's notion of "double truth"; in fact, in the twelfth century Ibn-Rushd (Averroes) had already been alleged by his opponents to believe something very like it. Despite NOMA's being a stance quite popular among scientists who neither want simply to discard religion nor yet desire to take its cognitive claims with any degree of seriousness,¹ it is neither experientially substantiated nor rationally supportable.

The most cursory acquaintance with the intellectual history of the last four centuries makes clear that there has been a degree of mutual influence flowing between science and religion, rendering quite untenable the supposition that they can be isolated from each other in watertight compartments. The influence that scientific discoveries have had on theology is manifest. Who could deny that the manner in which the doctrine of creation is interpreted and expressed today has been significantly influenced by discoveries in cosmology and evolutionary biology? These scientific advances have not caused theologians to abandon the substance of that doctrine (the belief that the will of God is the ground of the existence of all that is), but they certainly have resulted in a modification of the detailed content and style of its expression. In fact, this change has proved to be a gain for theology. Realization that God had created a world of evolving process, in which creatures could, in Charles Kingsley's pregnant phrase, "make themselves," rather than bringing into being a ready-made world of unalterable character, not only enhanced a religious apprehension of the fruitfulness of creation but also afforded theology some modest help with its greatest perplexity: the problem of theodicy. The great good of evolving fertility (theologically to be understood as the unfolding history of continuous creation) was seen to have an inescapable shadow side in the asso-

ciated raggedness and blind alleys inevitably present in a process based on the contingent exploration of potentiality. Genetic mutation is not only the engine that has driven biological evolution but is also a source of malignancy. You cannot have the one without the other. The anguishing fact of cancer is not gratuitous—something that a Creator who was a bit more competent or a bit more compassionate might easily have eliminated—but the necessary cost of the freedom given to creatures to make themselves. This kind of insight has played a part in encouraging what was one of the twentieth century's most fruitful theological developments: the recognition that creation is a kenotic act of self-limitation on the part of the Creator, allowing the created other to be itself and to make itself (see the essays in Polkinghorne 2001). God is not to be thought of as the all-controlling manipulator of a cosmic puppet theater.

The influence flowing from religion to science may seem less obviously visible. It certainly does not take the form of theology kindly providing ready-made answers to scientific questions. Rather, we have every reason to expect that scientifically posable questions will receive scientifically stable answers. Yet there are many questions, meaningful and important to ask, whose answers lie beyond science's self-limited power to address. Some of these relate to the metascientific underpinnings of the scientific enterprise itself. Arguments continue about the extent to which the common belief of the Abrahamic faiths in the rational will and free decision of the Creator—implying that the created world should be orderly yet contingent in its character—provided an ideological matrix for the birth of modern science in seventeenth-century Western Europe. It is unquestionably true, however, that the early pioneers were mostly people of religious conviction, even if some had trouble with the authorities (Galileo) or with orthodoxy (Newton). In any century, scientists need a trust in the existence of a rational order that awaits their discovery, and this act of faith is certainly encouraged by religious belief in the Creator—hence, perhaps, the frequent, almost instinctive, recourse to “mind of God” language in popular expositions, particularly those relating to fundamental physics.

Not only is NOMA contrary to actual experience; its approach is rationally flawed. To maintain its asserted separation it needs to appeal to highly dubious dichotomies, such as the notion that science deals only with public facts and religion only with private opinions. Both halves of this statement are in error. There are no interesting scientific facts that are not already interpreted facts. Mere counter-readings mean nothing unless one knows from prior theory what the instrument is actually measuring. In science, observation (“fact”) and theory (“opinion”) inextricably intertwine. This introduces a degree of precarious circularity into the scientific endeavor, but the long-term fruitfulness of explanation and understanding that science has been found actually to attain is persuasive: science is actually on to something, and it yields a verisimilitudinous description of the

physical world. I believe that the validity of this kind of critical-realist evaluation ultimately rests on a theological undergirding. The success of science is not a logical necessity that could be expected to be a property of every possible world but derives fundamentally from the facts that this particular universe is a creation and that scientists are persons made in the image of the Creator.

Equally erroneous is the notion that religion is based simply on a fideistic commitment to unsubstantiated opinion. Believers have rational motivations for their beliefs, just as scientists have rational motivations for theirs. Of course, in the case of religion, with its concern with the sacred reality that transcends human finitude, these reasons are more subtle and nuanced than is the case for science, concerned as it is with a physical world that we transcend and can put to the experimental test. Yet these reasons exist and are open to rational discussion and evaluation (hence apologetics). Although obviously placed at opposite ends of the spectrum of human rational inquiry into the nature of reality, religion and science are nevertheless intellectual cousins under the skin and so necessarily connected to each other.

Caiazza draws attention to what might seem to be another contrast between science and religion to which a NOMA advocate might appeal. Is not religion based on a static revelation, whereas science continually develops and progresses? Once again, a superficial difference dissolves in its apparent cogency under closer scrutiny. Of course, the given events to which Christian faith appeals (the history of Israel and the life, death, and resurrection of Jesus Christ) are unchangingly significant for theology, just as the given character of the universe is unchangingly significant for science. Yet, in both forms of inquiry, the meaning of what is given is a matter for continuing exploration. It is true that the just over one hundred words of the Nicene Creed remain as they were finally formulated at the Council of Constantinople in 381, but these concise clauses are really no more than a set of heads of discussion, specifying topics whose unpacking has been the subject for continuing theological investigation and development over the succeeding centuries. Theology is not a static discipline, as we saw when we noted the twentieth-century development of kenotic thinking about the divine act of creation. The motto of the theologian remains "Test everything; hold fast what is good" (1 Thessalonians 5:21).

Far from the science-religion dialogue being forced into the stalemate of an inconclusive draw, as Caiazza suggests, I believe that not only has it been in a state of considerable activity in recent years (as, for example, a survey of the papers published in *Zygon* over its distinguished forty-year history makes clear), it is beginning to enter a new and creative phase. A good deal of past work has either been historical in character (Galileo, Darwin) or has followed an agenda largely set by scientific discoveries (evolutionary biology, cosmology, the anthropic principle). No one could doubt

the necessity and value of these investigations; yet operating in these modes has often made theology seem to be merely responsive, even defensive, in what it has to say. I believe that the time has come for it to play a more proactive role in the dialogue. The topics for discussion should also include those that theology has chosen to place on the agenda. There are issues of this kind that are ripe for engagement.

One such is relational ontology, an exploration of the fundamental role of interconnectedness in our account of reality. Pursuit of this topic is strongly encouraged by trinitarian modes of thought, so that divine Reality and created reality are both to be understood in terms of "Being as communion" (Zizioulas 1985). Science traditionally has been methodologically reductionist, a strategy that has yielded many important insights, not least because thinking about simple bits and pieces is easier than thinking about complex totalities. Science's illegitimate philosophical offspring, scientism, has consequently sought to propagate a physically reductionist concept of reality, asserting the claim that, in the end, physics is all. However, reality fights back against such crass tactics, and, as science enters the twenty-first century, a variety of developments are forcing the recognition of the need for a complementary mode of holistic thinking. It is becoming increasingly apparent that "more is different," that the whole exceeds the sum of its parts. The investigation of holistic self-organizing principles, spontaneously active both in physical dissipative systems held far from thermal equilibrium and in the computer emulations of logical networks that complexity theorists study, provides a significant pointer in this direction. Perhaps the most challenging and exciting of all current holistic scientific discoveries is the phenomenon of quantum entanglement (the EPR effect involving continuing causal influence at a distance between two entities that have previously interacted) that has disclosed the presence of a deep-seated nonlocality in the account of fundamental physics itself. It has turned out that the subatomic world cannot properly be treated atomistically! The full implications of this remarkable discovery, both scientific and metascientific, await further exploration and evaluation, but it is clear that a style of thinking is going to be called for that initially might come more readily to a trinitarian theologian than to a traditional scientist.

A comparatively recent development in the content of the science-and-theology dialogue has focused on the challenging facts of both cosmic and human mortality and the question of the credibility of the eschatological hope of a destiny beyond death (Polkinghorne 1994, chap. 9; Polkinghorne and Welker 2000; Polkinghorne 2002; Peters, Russell, and Welker 2002). Christian thinking about ultimate destiny appeals to the concept of God's act of new creation rather than attempting to rely on a kind of evolutionary optimism based on the anticipation of a naturally achievable fulfillment occurring within the flux of present process.

Clearly, new creation is a topic for theological hope rather than scientific prediction, but the relevant theological discourse will surely have to be expressed in terms that do not deny the significance and value of the present world in the sight of God. An apocalyptic wiping clean of the cosmic slate, with the Creator's starting again absolutely from scratch, would seem to make this creation ultimately pointless. Hence, emphasis has been laid on the idea that the new creation arises *ex vetere*, out of the redemption of the old creation from its final futility. Such a concept requires that eschatological thinking hold in tension notions of both continuity and discontinuity. It must truly be Abraham, Isaac, and Jacob who live again in the kingdom of God (continuity), but they cannot just be made alive again in order to die again (discontinuity).

The discontinuity half of this eschatological dialectic is something about which theology alone can speak (and Paul began its exploration already in 1 Corinthians 15), but, for its part, science can suggest some constraints that theology must take into account when it turns to the criterion of continuity. In this world human life is intrinsically temporal and embodied. If it is truly human life that continues in the world to come, surely it will have to be "temporal" and "embodied" also—the quotes being necessary because the "matter" of the new creation cannot be subject to the thermodynamic drift toward disorder that characterizes the matter of the old creation and that is the source of this world's transience, and the "time" of the world to come is not merely the prolongation of the time of this world. For the Christian, the resurrection of Christ is the best guide to thinking about these matters. Some such exploration of eschatological credibility seems necessary if we are to be able to hold on with integrity to the religious conviction that the universe truly makes sense, so that the created world is a cosmos, now and always, and does not finally peter out into a futile chaos. The science-religion dialogue, in its new theological mode, can make a modest but valuable contribution to the exploration of these eschatological issues.

The intensification of the theological element in the dialogue is to be welcomed for another reason. In science, ideas become more illuminating and persuasive as they become more fully articulated. Thinking about the properties of the chemical elements progressed from William Prout's hypothesis (multiples of hydrogen) to Dimitri Mendeleev's highly suggestive layout of the periodic table and eventually to an understanding of atomic bonding in terms of the properties of outer electron shells, at each stage gaining increased coherence and explanatory power. Similarly, it seems to me, religious belief becomes more illuminating and persuasive as its theological formulations become more richly structured and worked out. That is why there are comparatively few general theists but very many adherents of specific faith traditions. The science-religion dialogue will benefit from

moving on beyond generalities (for example, natural theology) to more specific engagements (for example, trinitarian theology).

One cannot make such a remark, however, without immediately becoming aware of what is perhaps the greatest contrast between science and religion: the essential unanimity of scientific belief worldwide once the dust has settled in a well-winnowed regime, and the continuing perplexing variety of the world faith traditions. One of the most important issues on the contemporary theological agenda, not just for the twenty-first century but probably for the whole third millennium, is how to reconcile the evident presence of authentic spiritual experience within each of the traditions with the equally evident clash of the cognitive claims that they make. I have long thought that issues of faith and science represent an important common ground on which the faiths may meet each other in a nonthreatening way for the mutual discussion of questions of obvious significance (Polkinghorne 1998, 90–91). The recent founding of the International Society for Science and Religion represents the creation of a forum within which this kind of engagement can take place.

There is another dichotomy between science and religion that is often asserted and requires our attention: the alleged contrast between a scientific concern with fact and a religious concern with value. Caiazza writes, “The present state of affairs in Western culture is that religion as part of civil discourse is in retreat even in debates in which a religious perspective would be most helpful, such as those about human cloning or fetal research, while science and utilitarian ethics have seemingly captured the field” (2005, 12). My experience of serving on various committees advising the United Kingdom government on ethical issues relating to human genetics suggests a rather different evaluation. Perplexities most often arise not from dispute about basic moral principles but from different understandings of how they are actually to be applied in specific circumstances. For example, it is widely agreed in medical ethics that human persons are always ends and never merely means. Interventions must be for an individual patient’s benefit and not simply for the advance of medical science. But what constitutes the status of being a human person? Present arguments about the ethical permissibility of embryonic-stem-cell research focus precisely on the question of whether the very early embryo, possessing no structure beyond that of the DNA in each of its undifferentiated cells, is already a full human being, with the absolute moral standing that would attach to that. If it is a person, its destruction to yield stem cells would be as ethically unthinkable as would be the removal of the heart from a living adult in order to transplant it into someone else. If the early embryo is no more than potentially human, the possibility of its instrumental use for very serious purposes not otherwise attainable would seem to be ethically conceivable. This kind of discussion inevitably entangles assessments of

fact and value. My experience suggests that contributions toward the tackling of these problems from people with a religious background are welcomed, provided that they are presented in a temperate and argued way.

Those who hold a dualist view of human nature will tend to associate the bestowal of the spiritual soul, and concomitant personhood, with the moment of bodily conception and so reach a rigorist conclusion against embryonic research. Those who take a psychosomatic view of human nature will tend to see human personhood as something that is grown into with fetal development, in which case the instrumental use of the embryo before the appearance of the primitive streak at fourteen days will be an ethical possibility (Polkinghorne forthcoming). The issue of moral value cannot be detached from ontological judgments about the nature of human personhood.

One of the most striking ideas in Caiazza's essay is his concept of "techno-secularism," the utilitarian judgments and utopian expectations that are promoted by unrealistic assessments of the power of science entertained by members of an excessively "can-do" society. Citing Arthur C. Clarke, he goes on to tell of technology's having become the new magic. There is no doubt that in situations of great distress people instinctively long for magic, whether it be scientific magic (the wonder pill) or religious magic (the handy miracle). Yet one of the strengths of the religious traditions is their clear-eyed recognition that not all problems are soluble in any straightforward sense, least of all the universal problem of death. The honesty and integrity of this position, maintained in a world where false nostra and illusory expectations are perpetually being peddled, means that religion will always be indispensable to the human engagement with reality.

NOTE

1. In the United States, the National Academy of Sciences has adopted an official stance in relation to religion very similar to that of NOMA.

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