Religious Studies (2023), 1–12
doi:10.1017/S0034412523000975

CAMBRIDGE UNIVERSITY PRESS

ORIGINAL ARTICLE

Exemplars in 'science and religion': a theological dialogue with Thomas Kuhn

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(Received 31 March 2023; revised 19 October 2023; accepted 19 October 2023)

Abstract

This article argues that Thomas Kuhn's landmark work, *The Structure of Scientific Revolutions*, has not been adequately explored by theologians and scholars in the field of science and religion. While many cite Kuhn to suggest that science and religion share structural similarities, I contend that his work is crucial in addressing current debates about the definitions of 'science' and 'religion' and the potential for intellectual progress between them. Kuhn's framework provides more than a justification for adhering to incommensurable worldviews; it offers a nuanced understanding of how science and religion interact and the significance of tacit knowledge in scientific practice. This article explains Kuhn's focus on exemplars in his philosophy of science, which underpin his argument for key differences between science and theological inquiry. The article concludes that Kuhn's pluralistic view of truth offers theologians an opportunity to engage more deeply with science, rather than sidestepping it entirely.

Keywords: Thomas Kuhn; science and religion; exemplar; practice theory; theology and science

Introduction

Thomas Kuhn's *The Structure of Scientific Revolutions* is the most referenced work written in the twentieth century – generating over a citation per day since its publication (Abbott 2016, 167) – and yet, this article will argue, Kuhn's argument has been under-theorized in the field of science and religion. Theological appropriation of Kuhn has focused on two questions: does his work show that theology and science are more similar than previously assumed? If theory and observation are not neatly separated – if reasoning itself is made possible by commitments to paradigms – then perhaps science and religion lie on the same continuum of rational inquiry (Van Huyssteen 1999, 73). And does his theory of science undermine confidence in scientific realism, removing the motivation for interdisciplinary conversation? Perhaps by weakening belief that science approximates the truth, theologians will lack motivation to engage science (McGrath 2002).

These questions assume a narrow reading of Kuhn's philosophy. Rather than an apology for retreating into incommensurable worldviews, Kuhn's framework allows for a far more sophisticated understanding of the ways in which science and religion relate to each other and the role of tacit knowledge in scientific practice. This article uses Kuhn's philosophy to address two key methodological questions in the field of science

and religion: should scholars still use the category 'science' even though it cannot be neatly defined? And how do 'science' and 'religion' compare with respect to intellectual progress? I argue that Kuhn's emphasis on exemplars in scientific inquiry offers a better way to answer these questions compared to recent scholarship.

Thomas Kuhn and exemplars

Paradigms

Briefly stated, Kuhn's theory of science centres on the role of *paradigms*, defined as the shared beliefs, values, instruments, techniques, and metaphysics of a group (Kuhn 2012, 174). A paradigm determines both how research should proceed and what counts as an acceptable explanation. One becomes a scientist by studying and internalizing a paradigm; it shapes the way scientists perceive the world. Most scientific research – what Kuhn called 'normal science' – is about extending the paradigm to cover unsolved problems (Kuhn 2012, 10). This type of science is uncontroversial because everyone who accepts the paradigm agrees about how to solve new problems. Science displays progress in this phase because new work builds cumulatively on what came before it. Kuhn argued that as anomalies build up that cannot be explained in terms of the paradigm, it can lead to a phase of revolution, where a new paradigm takes hold with new criteria for what constitutes proper science (Kuhn 2012, 92).

Controversial implications seem to follow from Kuhn's theory. One is that science is not cumulative because paradigms replace rather than incorporate each other. Another is that there is no objective way to rationally adjudicate between competing paradigms, since it is the paradigms themselves that provide criteria for what constitute good science. Scientists will of course offer reasons to prefer their own paradigm (using criterion such as accuracy, consistency, scope, simplicity, fruitfulness), but there is no way to independently assess the evidence (Kuhn 1977; 2012, 205). Without a way to rationally justify the picking of one paradigm over another, critics accused Kuhn as portraying science as lurching irrationally from one paradigm to another (Lakatos 1970, 178).

Paradigms and exemplars

As has been especially argued by the philosopher of science Joseph Rouse, the insights of Kuhn have not been fully plumbed. The reason is that philosophy of science has traditionally been seen as a matter of epistemology; the main issues that occupy philosophers of science are the structure, sources, methods, and justification of scientific knowledge (Rouse 2003). The same is true for scholarship in the field of science and religion (Reeves 2018). As a result of the focus on epistemology, Kuhnian paradigms were interpreted as a core set of *beliefs* or a worldview that guides scientific inquiry, without which inquiry would be impossible. Scientists have difficulty talking to scientists who are committed to different paradigms, on this view, because a paradigm supplies the lens through which one views the world. Acceptance of a new paradigm is like a religious conversion or Gestalt switch – a sudden shift in belief and perception – because there is no common criterion with which to adjudicate between rival paradigms.

An epistemological interpretation of Kuhn is commonplace – indeed, Kuhn himself sometimes promoted it – but misses the more original and important meaning of paradigm given by him. As Kuhn says (2012, 187) in the postscript, 'The paradigm as shared example is the central element of what I now take to be the most novel and least understood aspect of this book.' Though he uses the word in multiple ways, the most original meaning of paradigm is that of an *exemplar*, a concrete achievement that guides the

https://doi.org/10.1017/S0034412523000975 Published online by Cambridge University Press

subsequent course of research in a discipline. Exemplars are specific problem solutions, not universal theories or principles, which provide scientists with a shared research trajectory. Because paradigms are exemplary ways of intervening in particular situations, advocates of those paradigms will try to generalize the skills and actions needed to perform the exemplar to new situations. As Rouse argues (2003, 108), 'accepting a paradigm is more like acquiring and using a set of skills than it is like understanding and believing a statement'. Scientists will choose problems that seem similar to the exemplary puzzles and try to solve them using techniques that are similar to those in the exemplary situations (Kuhn 2012, 187). An exemplar thus organizes the world as a field of research possibilities (Lipton 2005, 1264). More importantly, practitioners can produce new concepts, theories, and solutions from the exemplary achievements, even without fully agreeing with each other about how to specify them (Rouse 2003, 112). Kuhn need not appeal to a paradigm as an overarching 'worldview' to explain why scientists can agree about the future course of scientific research.

Interpreting a paradigm as an exemplar changes the meaning of many of Kuhn's basic concepts, including that of crisis and paradigm shift. A theory-oriented reading of Kuhn interprets a Kuhnian crisis to mean that scientists have become hesitant to fully commit to a theory and so cannot agree about what to believe about some phenomena. But uncertainty about theory is a normal and even positive feature of scientific inquiry because it can motivate further research. On an exemplar reading of a Kuhnian paradigm, a crisis results when scientists are unsure how to *act*. That is, scientists are unsure which concepts and models are reliable guides and what research is worth pursuing (Rouse 2003, 112). While a crisis may instigate scientists to try new approaches, it becomes less clear how the explorations relate to the exemplar and thus the significance of one's activity.

Dropping the 'mentalism' behind the notion of paradigm considerably changes the meaning of incommensurability (Warwick and Kaiser 2005, 405). When members committed to different paradigms have trouble communicating, the problem is not that they cannot construe one another's sentences or follow one another's arguments, but that they cannot grasp the significance of what the other scientists are doing (Rouse 2003, 112). As Rouse (2003, 112) explains, 'The more basic issue between proponents of alternative paradigms concerns how to proceed with research: what experimental systems or theoretical models are worth using, what they should be used for, what other achievements must be taken into account, and what would count as a significant and reliable result.' Without an exemplar to provide a common context for the solving of problems, it is difficult to agree to the future course or even proper interpretation of research (Kuhn 2012, 200).

Theological conversation with Kuhn

Having described the role of exemplars in scientific inquiry, in the rest of this article I will draw out the implications for scholars who wish to make methodological comparisons between science and religion. I will do so by addressing a key interdisciplinary question using Kuhn's framework: what characteristics, if any, distinguish science from religion?

What is 'science'

Is the category 'science' useful for scholarly analysis? The dominant trend in recent science and religion scholarship, following similar developments in the history of science, is to deny that there is any common feature underlying the word 'science' (Reeves 2018). The historian Peter Harrison (2015, 5) has been particularly forceful in arguing that 'We should not assume natural kinds where there are none.' To accept the idea of

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'science', so the argument goes, is to make problematic philosophical and theological assumptions that have been shaped by long-standing debates over science and religion in Western culture. The question raised by Harrison and others (Harrison and Milbank 2022), is whether scholars should find alternative terminology, given the negative implications of the term 'science'.

Kuhn himself would agree with Harrison that science is not a natural kind. One key implication of his philosophy is that what counts as scientific activity is often internal to the paradigm. Each new paradigm shift offers new standards for what counts as science. But Kuhn would also find the endless debates about the concept *science* not persuasive either. A key insight of *Structure* is that too much of traditional philosophy of science has focused on artificial debates on how to characterize science, leading to fruitless arguments over terminology. As he says (Kuhn 2012, 160) about debates in his own time,

> Men argue that psychology, for example, is a science because it possesses such and such characteristics. Others counter that those characteristics are either unnecessary or not sufficient to make a field a science. Often great energy is invested, great passion aroused, and the outsider is at a loss to know why. Can very much depend upon a definition of 'science'? Can a definition tell a man whether he is a scientist or not? If so, why do not natural scientists or artists worry about the definition of the term?

As I explain below, Kuhn thinks the word *science* can be used to roughly distinguish some intellectual activities from others, but one should not seek a list of essential criteria that neatly separates scientific from non-scientific research. Philosophers too often impose an artificial unity on the irreducible diversity of scientific practices and beliefs (Williams 1991, 22). It is this need to define 'science' that created the 'crisis of rationality' in the mid-twentieth century, for Kuhn and others merely needed to show that idealized models in the philosophy of science could not be reconciled to the history of science (Hacking 1983, 1).

What separates 'science' from philosophy and other intellectual activities for Kuhn is the ability of scientists to solve tangible problems. Scientific progress is as much about shifts in instrumentation and research practice as changes in belief or worldview. Science is a term that is awarded to disciplines that demonstrate 'obvious' progress, rather than ones that begin with a certain set of methods or techniques. He says (Kuhn 2012, 162), 'we tend to see as science any field in which progress is marked'. Kuhn's emphasis on scientific progress through problem solving is why he should not be described as a relativist. Exemplars in science are not easily created, and they at least must keep most of the puzzle-solving power of the preceding paradigm.

The natural sciences thus depend upon tacit knowledge in a way that other disciplines do not. To become a scientist, one must develop what Michael Polanyi (1958, 92) famously called 'tacit knowledge': knowledge that is gained not through words but through skilled action. Science for Kuhn 'was much more like the work of the goldsmith than the contemplative art of the philosopher' (Buchwald and Smith 1997, 364). The way to become a physicist is not to memorize scientific theories but to learn how to solve problems. As Warwick and Kaiser (2005, 395) explain, '[on Kuhn's account] the physicist's knowledge does not reside in mental retention of definitions and rules, but in the embodied ability to "perform" the solution to a problem when required to do so'. Thus, for example, the way to become a physicist is not to reflect on the inner meaning of F = MA, but learn 'to identify forces, masses, and accelerations in a variety of physical situations not previously encountered' (Kuhn 2012, 189). Because tacit knowledge is difficult to acquire through books, it is normally learned by immersion in a community that already has the knowledge – one learns to cook by working under another chef. The flexibility of

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skilful responses helps to explain why accounts of scientific method fail: rules are too rigid to capture the complexity of the responses needed in an ever-changing environment. While one can often abstract rules from an exemplary solution to aid training, rules cannot function in the exemplar's stead (Kuhn 2012, 192).

Kuhn's emphasis on scientific action fits well with arguments in the recent philosophy of science, such as James Woodward's (2003) influential book: *Making Things Happen: A Theory of Causal Explanation*. Like Kuhn, Woodward avoids giving an essentialist account of science – as if there were one standard that can neatly demarcate science from non-science – instead aiming to make sense of the causal inferences and explanatory practices commonly observed in the sciences. Scientific inquiry involves significant tacit knowledge and distinct practices of causal inference and explanation (Woodward 2003, 7). While the pursuit of understanding causation and explanation is a universal human interest, the sciences use more systematic procedures to isolate causes and use manipulations to uncover them (Woodward 2003, 19). Woodward contends that manipulation through experimentation is crucial to identifying causation. Woodward (2003, 61) summarizes his view: 'No causal difference without a difference in manipulability relations, and no difference in manipulability relations without a causal difference.' Science is not solely about developing an accurate representation of nature, but also about techniques that grant power over the natural world. An emphasis on skill is not to deny the importance of theory in science, but rather to say that scientific theorizing is normally tied to scientific action. Scientists seek accounts that explain what would happen if certain variables and parameters had been different, even if we are in practice unable to conduct certain experiments.

A consequence of this emphasis on tacit knowledge is that scientists do not require a complete metaphysics or worldview to identify relationships that give control over nature. As a physically embodied practice that relies on instruments, science is frequently pursued without a fully developed or accurate theoretical understanding of scientific activities. While the traditional view of science envisions scientific theories as completely developed semantic structures with distinct contents, an exemplar-reading of Kuhn maintains that there is no theory apart from its applications to concrete situations (Rouse 1998, 41). In other words, there is no theory that a scientist could entirely agree with, even if they desired to do so. As Rouse (1998, 42) notes, 'What the theory states about the world is not yet fully determinate, but only emerges over time in the practical uses of its concepts – uses that are embedded in material practices as much as in talk and calculation.' Scientists may articulate general theories to assist in directing their work, but these principles presuppose and cannot replace the practitioner's skills and tacit knowledge.

Many case studies in recent decades have documented the variance of beliefs and customs in different scientific locations, even by members with the same training in a paradigm. The picture one receives is of knowledge being continually adapted to local circumstances, not a universal mindset persisting through repeated transmissions in time and space (Rouse 1996, 63). Scientists are situated agents in an unavoidably partial situation who 'share not a background of beliefs but a situation that they understand in partially divergent ways' (Rouse 1996, 27). The 'epistemic drift' that occurs within scientific communities is a positive for scientific inquiry because it leads to multiple research trajectories.

The role of exemplars in Christian thought and practice

The first part of this article has argued that Kuhn's philosophy can reframe discussions surrounding the compatibility of science and religion, particularly with regard to debates over the category 'science'. Science refers not to a rigid set of methodological criteria to

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which all disciplines must adhere, but rather as a designation of distinction for those fields that demonstrate tangible progress in problem-solving, which are made possible by exemplars. These achievements are observable and quantifiable. This section will now consider the implications of Kuhn's philosophy for the field of science and religion.

The real question for scholars of science and religion is not whether a term is a natural kind – no categories of scholarly analysis can meet that standard – but why do some fields, such as theology, fail to make as much obvious progress as the natural sciences? When drawing methodological comparisons between science and religion, the key issue is whether theological traditions can solve problems comparable to science. Or to frame the question more narrowly: does theology have exemplars that are similar to scientific ones?

Focusing here on the Christian tradition, I see two general areas that display exemplars. The first is academic theology, which is typically practised in a university setting and focuses on questions that can be answered through biblical or historical analysis. The second is in the spiritual life of the Christian believer. I argue that both domains have exemplars, but they differ in important respects from scientific ones, which explains why problem solving within theology resembles, but could never match, scientific progress. In other words, theology cannot be considered a 'science' in the broad definition of the term given by Kuhn.

Exemplars in academic theology

As argued in the first part of this article, for Kuhn scientific research acts on and changes the world, and so is a kind of practical activity that resembles other types of skilled knowledge, such as cooking or carpentry (Rouse 1996, 127). Science, on this view, is not merely a formal body of knowledge, where scientists succeed or fail to the extent that they produce theories that match a mind-independent reality. Scientists too often are portrayed as something like philosophers: theoreticians whose main goal is to make correct statements about the natural world. As Kuhn explains, it is a common occurrence for scientific students to believe they have a proper conceptual grasp on a particular theory, but then are unable to solve the problems at the end of a chapter in a scientific textbook. Tacit skills form the foundation of scientific knowledge and are typically easier to verify because they produce outcomes that can be measured. This type of scientific knowledge is powerful because it can be accurately predicted in advance; practice equals performance (Lewandowsky et al. 2007).

An emphasis on tacit knowledge in the sciences is not to deny the role of theory or interpretation in the sciences. But it is to say that the exemplars learned by theologians differ in important respects from the embodied practices commonly found in the sciences (Reeves 2021). Rather than physical skill, theologians learn exemplars to gain theoretical skills, which are interpretative skills relative to a common problem set and background knowledge shared by a community. Theoretical skills are analogous to physical skills because they have standards of competence; it may take years to master the ability to make correct interpretations. These hermeneutic skills are practised until they become second nature, part of a set of background abilities that experts can bring to bear on a problem. Because their skills lie in the ability to make an interpretation rather than experimental manipulation, theologians do not directly make physical changes in the world; their outputs are intended to change human beliefs and actions. Because theologians produce results that are not physically observable, their skills must be confirmed by other theologians in a community who also have undergone the same training.

This model of theological learning can generalize to an entire religious community. As George Lindbeck has famously argued, 'Religion cannot be pictured in the cognitivist

https://doi.org/10.1017/S0034412523000975 Published online by Cambridge University Press

(and voluntarist) manner as primarily a matter of deliberately choosing to believe or follow explicitly known propositions or directives. Rather, to become religious . . . is to interiorize a set of skills by practice and training' (Lindbeck 1984, 35). While there is a level of expertise involved – which is why theologians require schooling – all believers seek to draw upon their communities' theological resources to navigate daily life.

The role of exemplars in theology is comparable to the field of law, where lawyers must pass a bar exam to show knowledge of basic cases and principles. This testing is possible because those laws are made explicit and cover a narrow range of concepts and ideas. It does not matter for the legal system if the law is just; it only matters that new lawyers will reach the same conclusions as others in the field (Porter 1996, 5). In a comparable way, the works of Augustine or Luther function as exemplars for future theological scholarship. As beginners are trained into intellectual communities, they learn what counts as data, how to integrate new information, and how to make convincing arguments. A nascent theologian learns the craft by modelling established scholarly examples and his or her work is corrected by teachers until he or she reaches maturity of judgement (i.e. can employ theological exemplars effectively).

By their nature, theoretical skills are more nebulous and prone to internal disagreement for two main reasons. First, theoretical skill is always relative to a body of information that may be controversial and up for negotiation and replacement as new information is received. An analogy would be if the proper size of the baseball strike zone were up for renegotiation each off-season. The issue is not the judgement of scholars but the criteria by which scholars make their judgements. A follower of Martin Luther will apply a different evaluative criterion to the doctrine of justification by faith than that of Thomas Aquinas. As Kuhn argues, theology does not progress because 'there are always competing schools, each of which constantly questions the very foundations of the others' (Kuhn 2012, 162). Intellectual communities are always arguing about how best to modify their intellectual traditions in light of new arguments, especially because even members of the same tradition often operate in different communities that influence their perspectives.

The second reason for expert disagreement is that the very act of interpretation is by its nature unpredictable. As Kuhn argued (and Wittgenstein before him), this is partially a result of moving from a finite number of agreed-upon examples to an open-ended, indefinitely large range of new cases (Bloor 2002, 9). Even when communities are in full agreement about rules of interpretation and examples to guide members to the right conclusion, there will be disagreement about how to handle new situations. Moreover, both theologians and scientists can hardly be expected to judge the same problem the same way: some might weigh certain evidence more heavily versus another or value some principles over others (Kuhn 2012, 198). Scientific communities manage this interpretative conflict by constructing new experiments to resolve disagreements. Ongoing scientific research thus can constrain and in certain cases resolve interpretative pluralism.

Theological communities by contrast solve this by stipulating further rules or try to standardize the judgement to order to minimize interpretative flexibility. Consensus in theology often occurs by limiting the size of the community to those who agree on the basic exemplars, rather than generating unanimity across theological traditions. From this perspective, the emergence of creeds and authorized texts does not represent universal theological consensus but comprises attempts to limit who is authorized to offer theological interpretations. Further participation in the community is restricted to those who abide by established precedent.

Exemplars in Christian spirituality

The spiritual and ethical life of everyday Christians is another place in the Christian tradition where exemplars play a significant role. While there are important overlaps

https://doi.org/10.1017/S0034412523000975 Published online by Cambridge University Press

between theological inquiry and the spiritual life, they are distinct disciplines. One may solve theological puzzles without any personal spirituality, or one may adapt spiritual practices without any deep knowledge of a theological tradition or skill in articulating theological propositions. The aim in spirituality is not to supply better interpretations of Christian doctrine, but to grow in one's ability to perceive the Divine and act from a Christian perspective. This may involve skills to make God's presence felt during everyday life or examples to guide ethical decision-making. Believers must train themselves as they learn how to emulate and follow the exemplars of spiritual teachers.

Embodied skill is almost as important in the spiritual life as the scientific. Just as an experimenter needs the requisite skills and training to bring about the desired experimental outcome, so too Christians must acquire tacit skills to be a Christ follower. Someone who uses religious language but does not physically emulate Jesus' teaching is not a true disciple, just as one cannot be a scientist by merely mimicking scientific language. As Jesus (Luke 6:46) asks in the Gospels: 'Why do you call me, "Lord, Lord," and do not do what I say?' The content of Christian theological vocabulary (e.g. grace, salvation) gains its meaning through applications of those terms to one's neighbours. Without skilled practice, key theological concepts such as 'forgiveness' and 'love' lose their meaning. Can one say one 'loves' one's neighbour if one passes them in distress by the side of the road (Luke 10:29–37)?

An emphasis on skilled practice shows why a fully realized interpretation of the Christian faith is not necessary for living a Christian life. For the scientist, knowledge does not consist in the mental retention of scientific theories but in the ability to use exemplars to find fresh solutions to problems. Thus, for example, the task of an everyday scientist would not be to explicate the full meaning of Newton's theory of mechanics, but rather to take the skills acquired from learning Newton's exemplar and find new situations to which the same skills might apply. In an analogous way, the Christian faith is not simply a matter of giving verbal assent to creeds, but the ability to use the set of Christian exemplars to solve the problems of daily existence. Jesus said that one should judge a tree by its fruits, which one can interpret to mean that one can judge a person by their ability to live their faith skilfully.

One reason why Christianity and other religious traditions use exemplars to develop ethical judgment in believers is that it is almost impossible to develop a detailed list of moral rules that cover all the complexities of daily life, just as one cannot develop a list of rules to cover the complexities of a scientific research programme (Devries 1986, 199). Even in Orthodox Judaism, which might contain the most rules of any religious tradition, full ritual observance is an aspirational goal that few reach (Luhrmann 2020, 37). In Christianity, it is generally considered better for believers to internalize the moral exemplars so that they can adapt their behaviour to a near-infinite variety of new situations. One internalizes the moral exemplars not through abstract reflection but through learning how to apply exemplars to concrete situations. This is why moral education throughout history has used exemplars as a way to identify and cultivate the virtues (Croce and Vaccarezza 2017, 6).

This article cannot hope to address all the possible connections between Kuhn and the rich tradition of virtue ethics and so will focus on two issues that Kuhn's philosophy might help to clarify. One question that arises in the ethical literature: do exemplars refer to particular individuals or concrete solutions? In other words, for a Christian is the person of Jesus Christ the exemplar or just the specific teachings of Jesus? Some moral theorists like Linda Zagzebski emphasize the role of wise individuals who can teach and define moral traits. From this perspective, 'a virtue is a trait we admire in an exemplar' (Zagzebski 2017, 21). Following Kuhn, I think it better to equate moral exemplars with specific teachings, comparable to concrete solutions in a scientific paradigm.

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Concrete solutions call for replication and thus are difficult to ignore in the process of ethical formation. The parable of the Good Samaritan is offered explicitly as a tangible solution; regardless of one's high self-regard for one's piety, one is not following the example of Jesus if one walks by someone in need. It is only by comparing one's life to specific solutions that one can judge adequately if one is truly obeying Christ's teaching. From this perspective, the mission of Christian theology is not to merely educate others in theological propositions, but to teach embodied skills such as compassionate giving or forgiveness, with the disciples' job being to find more and more situations where the lessons of Jesus's parables could apply.

Kuhn's use of exemplars also draws attention to the change in perception that happens during spiritual development. One interesting feature of scientific exemplars for Kuhn is that they not only give one new abilities to act, but they also change perception of the world. Scientific training shapes not only behavioural habits but also an individual's self-image, perspectives, attitudes, values, desires, and objectives, all of which that bear the marks of time and place (Rouse 2007, 512). Training with exemplars causes scientists to see the world differently; they tend to notice features of the world that can best be explained by a paradigm. The emphasis on perception in Kuhn's philosophy leads to one of his most controversial assertions: that after a paradigm shifts, the 'world' changes. He says (Kuhn 2012, 6), 'each [revolution] transformed the scientific imagination in ways that we shall ultimately need to describe as a transformation of the world within which scientific work was done'. For Kuhn, the 'world' we experience is a joint product of the physical structure of nature and our cognitive understanding of that environment, which is shaped by scientific paradigms. It is possible to interpret the same sense data in multiple ways (Kuhn 2012, 195).

Christian spirituality likewise is a training in how to perceive the world, which has been shown in the anthropologist Tanya Luhrmann's book *How God Becomes Real*. Against traditional work in the cognitive study of religion which seems to suggest that belief in gods is easy (e.g. we are 'Born Believers'), she argues (Luhrmann 2020, xii) that 'People don't (easily) have faith in gods and spirits.' Gods and spirits are different from the realm of everyday objects and so experience of them requires talent and training. In a Christian context, attending church, prayer, and other spiritual disciplines are employed so that God is 'more real, more relevant, and more present' (Luhrmann 2020, 1). When learning how to identify the presence of God, participants in one congregation were taught how to recognize bodily patterns: 'some through warm tingling; others through goose bumps; still others through images, impressions, or scriptural phrases' (Luhrmann 2020, 51). By developing skills such as concentration, 'absorption' of the world, and self-awareness, Christian laypersons are taught to identify God in their own experience and the world around them (Luhrmann 2020, 58).

Despite overlaps with the scientific training of perception, Christian theology will never generate consensus as sometimes occurs in the sciences. The sciences, as argued previously, look for 'relationships that are invariant under interventions' (Woodward 2003, 242). Invariance means that the same values between variables hold when we act to manipulate them. Invariance is what allows for technology; one can predict the conditions for producing natural phenomena that can be built into modern devices. Natural science is the search for repeatable patterns, which are most easily found through quantifying phenomena by careful measurements. As the historian Porter says (1996, 220):

> The universality of scientific knowledge is by no means complete, but the most sceptical sociologist readily concedes that it is impressive. Is it not to the impersonal, objective methods of quantification and experimentation that we owe the universality of science? . . . What makes science more impersonal helps it cross the boundaries of nation, language, experience, and discipline . . .

https://doi.org/10.1017/S0034412523000975 Published online by Cambridge University Press

In the conduction of a large physics experiment, for example, it is mainly predictions and measurements that pass between experimental and theoretical physicists (Galison 1999).

Christian spirituality, by contrast, looks to develop a relationship with a supernatural agent, which is not a natural process that can be manipulated. As the Jewish theologian Martin Buber argued, it is a fundamental mistake to address the divine in the third person, as an 'it' that can be measured and manipulated (Buber 1937). And while religious rituals do produce change, the development is not as direct and not as easy to measure or reliable because many do not bring about the intended results. As both the Hebrew Bible and New Testament show, it is a normal part of the spiritual life to feel forsaken by God. Even when instituting all the right religious practices, one may not experience the Divine presence.

Conclusion

This article has used the philosophy of Thomas Kuhn to give a rough definition of science (i.e. disciplines that make obvious progress), describe the roles of exemplars in scientific progress, and to argue that the exemplars in Christianity differ in important respects from the sciences. While there are some similarities between science and theology, this is not enough to justify the frequent argument made in the twentieth century that theology is a type of science (Reeves 2018). While Murphy (1990) is correct that theological research programmes can solve problems in a way that is comparable to the sciences, her analysis misses the role of 'tacit knowledge' in science: knowledge that is gained not through words but through skilled action. Drawing upon the work of Kuhn, I have argued that scientific research reconstructs the world as well as redescribes it and so is a kind of practical activity that bears strong affinities to other types of craft knowledge (Rouse 1996, 127).

My analysis of Kuhn has implications for three other issues that are debated in the field of science and religion. First, should scholars of science and religion abandon the category 'science' (Harrison and Milbank 2022)? Whatever terms we use to describe what we currently call 'science' and 'religion' will have to account for basic differences between scientific and religious practices (Reeves 2023). In other words, it is not clear how renaming 'science' as 'natural philosophy' or something else would alter how scientists engage with the natural world. The differences between religious and scientific practices helps to explain why critics (Grey 2021, 489) of new approaches in science and religion will always ask: are you not presuming old categories when you try to give them up? Any new terminology for 'science' will have to incorporate Kuhnian exemplars and problem-solving to be compelling.

The second question is whether methodological naturalism is benign or should undermine theological confidence in the conclusions of the sciences (Torrance 2017)? This article has emphasized that science is more about skill than belief. Philosopher Joseph Rouse (2003, 116) explains the difference with an analogy: 'Biologists understand cells in the sense in which we say that a good mechanic understands cars. Biologists and mechanics can, if asked, produce many true sentences about what they work on, but that is hardly the point in either case.' The primary goal of science is not to produce true sentences but to transform our ability to manipulate and control the natural world. From this analysis, we might ask: how could an embodied practice designed to manipulate repeatable patterns be anything other than naturalistic? A mechanic who accepted supernatural explanations for an engine noise would make car repair impossible, for it would be unclear how such supernatural explanations could be reliably directed and controlled. Likewise, one could say that scientists who invoke miracles for natural processes have violated disciplinary norms, since their goal is to uncover natural causes that can be experimentally manipulated. The requirement of command and control over nature thus puts

https://doi.org/10.1017/S0034412523000975 Published online by Cambridge University Press

supernatural explanations outside the boundaries of science. Spiritual exemplars may too be embodied practices, but they primarily aim to change how believers perceive the world and do not allow for the same manipulation of nature as the sciences do.

A final question that Kuhn helps to answer is: does science approximate truth? On the one hand, Kuhn explicitly rejects the idea that 'truth' plays a helpful explanatory role in explaining why we prefer some scientific theories to others. As he says, 'Does it really help to imagine that there is some one full, objective, true account of nature and that the proper measure of scientific achievement is the extent to which it brings us closer to that ultimate goal?' (Kuhn 2012, 116). On the other hand, Kuhn does believe in the idea of scientific progress. Some theories are superior to others, even if we are reluctant to describe them as true. Rather than denying truth, one might say that Kuhn is a pluralist: there will always be multiple ways of reading the scientific data, which is why referring to 'truth' in the singular is misleading. But this does not mean that 'anything goes' or that any scientific claim can be supported. With regard to the field of science and religion, we might say that theologians should engage science not because science gives absolute truth, but rather because science constrains what can be said about the natural world. Many older theological renderings of nature are no longer tenable as science has progressed, but there is nonetheless always room to interpret scientific data in alternative ways, which allow space for religious presuppositions to function as 'shaping principles' for theory choice (Koperski 2017, 152). Kuhn's work is thus an invitation for more theologians to engage with science, rather than avoid it altogether.

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Cite this article: Reeves JA (2023). Exemplars in 'science and religion': a theological dialogue with Thomas Kuhn. *Religious Studies* 1–12. https://doi.org/10.1017/S0034412523000975