

SCIENTIFIC AND THEOLOGICAL REALISM

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1 Introduction

In this paper I shall explore the parallels and contrasts between scientific and theological realism. I shall start by providing an outline of the various aspects of scientific realism before looking at these in more detail and in comparison to theological realism. I hope that by this comparison with the well-developed debates between various species of scientific antirealists and realists, that some light may be shed on debates concerning realism in theology.

The term ‘scientific realism’ covers a variety of related positions. These may roughly be divided into the metaphysical and the epistemological. The former concerns the subject matter of science. The realist and antirealist may disagree on the correct answer to the question, ‘what is particle physics about?’ Since such questions may be couched in terms of the reference of the key terms of science, we may regard many of the important debates concerning realism as debates about the semantics of scientific terms. Epistemological realists and their opponents take positions on what we can and do know in science or on whether our scientific beliefs are justified. A third area that links with both parts of the realism debate concerns the question, ‘what is the aim of science?’

I shall briefly consider each of these three aspects of the scientific realism-antirealism debate before looking at the parallels in the theological realism-antirealism debate. My conclusion will be that metaphysical antirealism faces many obstacles both in science and theology. If anything the obstacles are greater in theology, even though antirealism is a popular option among theologians. Epistemological antirealism (scepticism, agnosticism, atheism) is better grounded, but in science there are strong responses that do not have theological parallels. Consequently, the theological *metaphysical* realist is threatened by epistemological antirealism.

2 Metaphysical/semantic scientific realism

I shall consider various claims that are typical of those made by scientific realists.

2.1

“The world as investigated by science is largely mind-independent”¹

¹Cf. Boyd 1991: 195.

This claim is intended to rule out idealism. As such this is a rather more general issue in metaphysical realism and antirealism than one limited to the philosophy of science. Nonetheless many scientific realists assert this claim, for two reasons. First, because general idealism is global it applies to the objects of scientific inquiry in particular. If, for example, one holds that any entity is just some congeries of ideas in the subject's mind, then cells, atoms, magnetic fields and so on are also only congeries of ideas in the mind also. This creates particular difficulties for entities the subject has not yet given any thought to, such as some as yet undiscovered subatomic particle. On this idealist view, since there is no idea corresponding to the undiscovered particle, that particle cannot exist. Consequently, discovery is not so much a matter of coming to know about something that previously existed but of whose existence one was previously unaware, but rather it is instead a matter of bringing something into existence by thinking about it.

It should be noted, however, that Berkeley's response to an analogous problem may cut the link between general idealism and scientific antirealism. If to exist is to be an idea in the mind of God, then the distinction between genuine existence and merely being thought to exist by a scientist (and between non-existence and ignorance of existence) can be maintained. The entities of science would be dependent not on the mind of any scientist or group of scientists but rather on the mind of an independent being, God. Thus there could be room for the other debates we shall consider to be live debates within a general idealist framework.

The second reason why scientific realists feel required to assert a rejection of idealism is that some writers in the 'science studies' tradition (though not any philosopher of science of note) seem to adopt an idealism concerning the subject matter of our most favoured scientific theories. According to social constructivists (or 'constructionists') cells, atoms, magnetic fields etc. are 'social constructions' the work of scientific communities, rather than entities uncovered by those scientists. In this connection Kuhn's (1962) comment that as a result of a scientific revolution the scientist's world changes also, is often cited as an instance of this sort of view. However, it is highly debatable whether Kuhn was saying anything that implies that such entities, while genuinely existing, are also brought into existence by the beliefs of the scientists. Paul Hoyningen-Huene gives a Kantian reading of Kuhn that perhaps comes closest to this. According to this view there is a world-in-itself that is unchanging but there is also a 'phenomenal world' the world of the scientists' perceptions and belief, that does change. The scientist is trapped within the latter and has scant if any access to the former. Another view, which to my mind better captures Kuhn's original intentions, is simply to regard the use of 'world' as metaphorical (just as it often is in everyday speech). A change of 'world' is a certain kind of psychological upheaval, not any change to the cells and atoms themselves. Similarly, it seems that when pressed the social constructivists may be just expressing in a misleadingly dramatic way the view that our theories respond rather less to the world than realists think and rather more to the social relations among scientists (or between science and the rest of society). That is, social constructivists may be taken to be making an epistemological point in metaphysical terms: what explains belief in, e.g. neutrinos, is not an objectively rational response to the evidence but rather a set of social and political commitments that exist largely independently of any imperceptible micro-entities. In this epistemological guise I shall consider social

constructivism again below.

2.2

“Names of scientific kinds and properties are genuine referring terms”²

Here the idea is that when we talk of electrons, as in e.g. ‘electrons are negatively charged’, we are talking about certain entities and ascribing a property to them. The contrasting view is that this apparent logical form is misleading and a proper analysis of the given sentence will reveal that it is not about such entities at all, at least not about imperceptibly tiny entities that a naive view will take ‘electrons’ to be. The function of the sentence is not to ascribe a property to entities but is rather to play a role in making predictions about the results of laboratory and other observations. Percy Bridgman’s operationalism helps clarify this idea. According to operationalism to say ‘the gas is at 1134 K’ is to assert that the observed result of a properly conducted measurement using a thermometer of some specific type will be 1134 K. We can generalize this for all theoretical claims. Thus ‘electrons are negatively charged’ may be taken to assert something such as ‘the bright spot on the phosphorescent screen of a cathode ray tube will deflect towards the anode, when an anode and cathode pair are placed across the cathode ray tube’.

In general, for the antirealist of this stripe, it is only terms that relate to observable entities and properties that refer. The terms of theoretical science, that superficially seem to refer to unobservable entities and properties, must be treated in a semantically distinct fashion. Thus we have, in effect two languages, a language of observational terms and a language of theoretical terms. As regards the latter, one possibility already considered is that it is analysable in terms of the former. And so all scientific sentences are about something, only the things they are about are all observable. An alternative, inspired partly by problems in implementing the first proposal, is that the theoretical language is irreducible. In which case a question is raised about the meanings of sentences employing theoretical terms. The answer given was that individual theoretical terms get their meanings in a holistic manner, via the roles they play within theories and that theories or groups of theories get their meaning via the (non-reductive) links they have with observational language.

2.3

“Theoretical assertions are truth-apt”

If, according to the antirealist we have just been considering, theoretical assertions are not about theoretical entities, and they are also not reducible to assertions about observable entities, what then makes the assertions true (or false)? One possibility is to adopt an holistic approach paralleling the holistic, theoretical-role view of meaning just considered; this would be coherentism about truth. But an alternative is simply to deny that strictly speaking theoretical claims have truth-values at all (to deny they are truth-apt). The function of truth-apt assertions is to describe, whereas the function

²Cf. Boyd 1991: 195.

of theoretical claims is not to describe but to provide a means of making accurate predictions. Theories may be adopted or rejected on the grounds of being reliable instruments for prediction or unreliable. But acceptance is not acceptance as true, nor is rejection a matter of taking to be false.

Thus a realist rejecting this view will claim that theoretical assertions are either true or false. The realist may go further in asserting that truth for theoretical claims is the same as truth for observational claims, rejecting the view that the former should be given a coherentist account whereas the latter should be given some other account. More generally still, the realist will assert that the semantics for theoretical expressions and sentences containing them should not differ from the semantics for observational expressions and sentences. The realist's claim that scientific terms are referring terms (discussed above) may be seen as an instance of this (if it is held that observation terms are referring terms).

3 Epistemological scientific realism

We have briefly examined the debate between the realist and antirealist as regards the content of scientific, typically theoretical claims. I shall now turn to epistemological matters. The term 'scientific antirealism' covers both metaphysical/semantic issues *and* epistemological ones. Epistemological antirealism is typically not called 'antirealism' outside of philosophy of science, but rather 'scepticism'. Nonetheless, as we shall see, there is an intimate relationship between metaphysical antirealism on the one hand and scepticism on the other, in such a way that it makes sense to regard them as different sides of the same coin.

The epistemological realist will want to say something positive about a grounds for belief in our best theories, while the antirealist will take a more sceptical line. In such debates metaphysical/semantic (scientific) realism is typically assumed. For example, one might be sceptical about the theory of neutrinos because neutrinos, if they exist, are unobservable and very difficult to detect in other ways. But to assert such grounds for scepticism is to accept that the existence of neutrinos is independent of our beliefs, that claims about neutrinos are truth-apt and that 'neutrino' is a referring term.³ Note that the dependence of scepticism on metaphysical/semantic realism provides a motivation for metaphysical/semantic antirealism. The metaphysical/semantic antirealist is able to claim that there is no problem in knowing the truth of theoretical assertions since (on one view) they are equivalent to observational assertions. Or (on another view) the problem of knowing just doesn't arise, since the assertions are not truth-apt (and knowledge or otherwise requires truth-aptness).

3.1

"It is possible for science to provide good reasons in favour of theories."⁴

³Note that a term can be a referring term without succeeding in referring—e.g. 'phlogiston'

⁴Cf. (Boyd 1991: 195)

The above is a very general and reasonably weak expression of the epistemological optimism of the realist, which can be strengthened or extended in various ways. Most obviously it can be supplemented by the claim that the possibility mentioned is actual, that as a matter of fact modern science does give us grounds for preferring some theories over others. A stronger claim is that our reasons can (and do) give us reasons for believing a theory, and yet stronger is the claim that these reasons can (and do) give us scientific knowledge.⁵ A strengthening in another dimension is to claim that the theories that make the above assertions true include theories concerning unobservable entities.

Epistemological antirealism will reject in some measure some or all of the optimistic claims made above. Thus some kinds of antirealism may be sceptical as regards theories concerning the unobservable but not as regards the observable. The grounds for sceptical antirealism are many. I shall briefly mention the major ones.

3.1.1 Inductive scepticism

Those convinced by Hume's problem of induction will inevitably be sceptical as concerns pretty well any scientific theory, since almost all theories make assertions (so it seems to most philosophers) that go beyond the evidence in the sense that the theory is not deducible from the evidence. Popper was the most prominent advocate of inductive scepticism in the philosophy of science. Nonetheless he did not hold himself to be an antirealist, on the grounds that he believed that the some kind of epistemological optimism may be retained thanks to his falsificationism. The consensus now is that if induction is rejected, falsification cannot provide a basis for optimism.

3.1.2 Rejection of Inference to the Best Explanation

Many philosophers of science hold that many of our most important inductive practices can be aptly described by the phrase 'Inference to the Best Explanation' (IBE). One reason why IBE is significant is that it appears to be the mechanism whereby we justify our beliefs in the existence of unobservable entities. For a long time physicists believed in the existence of neutrinos because they best explain mass and spin discrepancies in beta decay. There are various reasons why an antirealist might reject IBE: (i) why should 'better' explanations be more likely to be true? (ii) the criteria of 'goodness' (e.g. simplicity, elegance) are too subjective to be a reasonable basis for the inferring the truth of a theory; (iii) it is unlikely that the true theory is among those we have considered—so choosing the best will typically be to choose a false theory.

3.1.3 Underdetermination of theory by evidence

The third complaint against IBE draws upon a more general problem advanced by antirealists. It is alleged that our theories are radically under-determined by the available evidence. That is, the evidence we actually have and could reasonably hope to have is such that many theories (infinitely many) are consistent with that evidence. Such a

⁵Arguably the last claim isn't stronger than its predecessor, if one holds that one should not believe something unless by believing one would know it.

claim needs supplementation for it to have any sceptical consequences, for it needs to be shown that there are infinitely many hypotheses that explain the data equally well.

3.1.4 Pessimistic (meta-)induction

Previously well-confirmed theories are typically rejected by later developments. Therefore we can expect our current (and future) best theories to be refuted in turn.⁶

3.1.5 Epistemological social constructivism

Science is merely a social construct, similar to the arts or a political system, differing primarily in that it makes a claim to have privileged access to an objective truth. But this claim is only a political manoeuvre to claim corresponding privileges for scientists. As in these other areas of activity, developments are explained by social and political forces, and are not the outcome of an impartial examination of an objective nature.

3.2

In favour of realism, many realists (but by no means all) subscribe to the No Miracle Argument (NMA):

“Realism ... is the only philosophy that does not make the success of science a miracle.” (Putnam 1975: 73)

The NMA can be understood as an instance of IBE. The only satisfactory explanation of the success of science is that science is an effective mechanism for getting to the truth. The various epistemological antirealist claims considered above can be read as attempts to undermine the NMA. Objections to IBE are objections to the form of inference employed by the NMA. Underdetermination raises the possibility that many false theories would be equally successful. In which case the truth of our best theories is not the best explanation of their success. Social constructivism alleges that the best explanation of the ‘success’ of science is that this so-called success is measured by the scientists themselves. For example, we are told that Quantum Mechanics is the predictively most successful theory of all time. But its predictions concern the behaviour, primarily, of sub-atomic particles. So the predictions are assessed by scientists on the basis of abstruse scientific theories. Thus success of quantum mechanics is not independent of science but is itself part of science.

4 Realism and the aim of science

Another area where antirealists and realists disagree concerns the very aim of science. Realists will typically claim that science aims at the truth, hoping to achieve at least increasing nearness to the truth. Realists may even claim that science aims at producing knowledge. Antirealists may claim that science aims at less than truth. Thus van Fraassen (1980) takes the aim of science to be empirical adequacy—the theories of

⁶Psillos (1999: 101-114) discusses and rejects the pessimistic induction.

science should have only true observable consequences (science does not aim to assert truths concerning the unobservable). This reflects a long-standing empiricist and positivist tradition. Others such as Laudan and Kuhn (1962) take science of be in the business of solving scientific puzzles. Note that they do not require that a puzzle-solution be true to be an adequate solution, only that it fit in the with current practice of science. Lastly, social constructivists will claim that the aim of science is the perpetuation of science itself (or, more bluntly, the scientists themselves and whatever class or other political interests they have).

5 Metaphysical realism in science and theology

The scientific realist takes the scientific claim ‘electrons are subatomic entities too small to be perceived that are negatively charged and are constituents of atoms’ at face-value. ‘At face-value’ means that the sentence should be understood as on a par with ‘pips are the parts of an apple that may grow into a tree’ or more generally that the semantics of that claim and other scientific claims should not differ from the semantics of the bulk of non-scientific claims. Thus, taking it for granted that ‘apple’ refers to a kind of tree or its fruit, then ‘electron’ refers to a kind of subatomic particle. In each case we do not think that what it is for entities belonging to the kind to exist is dependent on human thought. Correspondingly the theological realist will take claims about God’s existence, nature, and actions at face value. Thus when the Nicene creed opens “We believe in one God the Father Almighty, Maker of Heaven and Earth, and of all things visible and invisible.” The realist holds that the belief in question is a belief about God and the belief is true only if God did make Heaven and Earth, in just the same sense as when some one says “I believe that Phidias carved the Elgin marbles’ that statement is about Phidias and is true only if he did indeed carve those marbles. The metaphysical realist, qua metaphysical realist, is not strictly committed to the truth of such assertions, but is rather committed, primarily to claims made about what would make the assertions true. In this sense most atheists are metaphysical theological realists. They agree that what would make the assertion ‘God made Heaven and Earth’ true is the existence of a divine creator amongst whose works are Heaven and Earth—they just deny the existence of such a creator. For this reason the relevant kind of realism is best expressed in semantic terms. Theological claims should not receive a special kind of semantic analysis just in virtue of being theological. Theological language is not distinct in this sense from the rest of our language.

5.1 Projectivism

Metaphysical social constructivism in science is difficult to take seriously. But a theological parallel has influential support. Non-theism (a version of which is Contemporary Christian Humanism) takes God to be the Sum of our Highest Ideals. Such a proposal originates with Feuerbach (1866). More generally, religious projectivism proposes that God and other elements of theology are projections of some human or social entity.

Broadly speaking projectivism can be taken in two ways, an epistemological or causal way and an ontological way. The epistemological/causal way takes the “God is X” equation as shorthand for a causal explanation of religious beliefs and activities. Thus, if it is proposed, in this way, that God is the Sum of Our Highest Ideals, then it is being suggested that the psychological importance of our ideals causes a belief in God. Or, as in another of Feuerbach’s proposed projections, God is the projection of the human longing for significance. This is consistent with a literal, semantically realistic view of the content of what is believed. A religious, Christian belief in God has the *content* that an all-good person created the world, loves us and so forth. This epistemological projectivist view is nonetheless epistemologically antirealist because it follows that, since the cause of the beliefs is a human/social cause rather than a supernatural cause, the beliefs cannot amount to knowledge.⁷

The nearest to projectivism in the philosophy of science is Comte’s (1892) account of the metaphysical stage of the development of knowledge. According to Comte’s ‘law of three stages’, human knowledge starts with a theological stage, whose explanations are religious. This gives way to the second, metaphysical stage, whose explanations are in terms of essences and imperceptible entities, such as forces. The third and final stage is the positive stage, which concerns only correlations among what is observed. Note that Comte’s view concerns not all science but only certain parts of science or ways of doing science (those which invoke the unobservable). According to Comte, the projection that is a belief in unobservable entities is not simply analogous to the projection that is a belief in God, but is a hangover from it. While the unseen supernatural causes have been eliminated they have been replaced by unseen natural causes. Whether Comte’s account is strictly projectivist is perhaps a moot point. For it is not clear where projectivism ends and a socio-psychological account of belief allied with an error theory begins.⁸ Karl Marx’s account of religion falls more obviously into the latter category. Marx also suggested that Darwin’s theory of evolution through natural selection owed its origins to Victorian capitalism. Although the suggestion was not developed by Marx himself, subsequent social constructivists have sought political and other social and psychological explanations not only of the origins of scientific ideas but also for the acceptance of those ideas.

The metaphysically projectivist reading of “God is X” takes that statement to assert a genuine identity (where X = the sum of our highest ideals, etc.). Consequently some religious beliefs will come out to be true—for example “God exists” (because there is a sum of our highest ideals). Some reductive versions of empiricism provide an analogue to this view. If we have a positive view of scientific enquiry we may hold that the cause of a scientist’s beliefs is the observational evidence she has. So one way of making science reasonable without invoking unobservable entities is to equate the observational and the theoretical. Optimally we would have identities of the form “electrons = X” where ‘X’ is an expression employing only vocabulary that

⁷Strictly one could have such religious beliefs caused in this way that turned out to be true, and so such views commit one to agnosticism. But the position is a natural one for an atheist to adopt, and it is natural to call such an account an ‘error-theory’ of religious belief.

⁸The distinction I have in mind is this. The cause of the belief in the projectivist case is some something inner, an individual’s own psychology, whereas in the social constructivist case the cause is something outer, e.g. something political or social.

describes observable things and properties. This would be parallel to the idealist claim that physical objects are congeries of ideas. Thus any claim about electrons would be really a claim about observable things and qualities. The gap between the causes of our scientific theories (our evidence) and the theories themselves would not be a gap between the observed and the unobservable, but rather, at most, a gap between the actually observed and some generalization thereof (which may cover the unobserved but nonetheless *observable*). Operationalism, we saw, expressed this view with respect to theoretical quantities, regarding them as identical to the outcomes of measuring operations. Such proposals run into difficulties when we attempt to work them out in detail. For example, there are many distinct ways of measuring temperature (mercury thermometer, gas thermometer, Galileo thermometer, resistance thermometer as well as various spectroscopic ways of measuring temperature, among others). So strictly there should be, according to operationalism, not just ‘temperature’ but a variety of different kinds of temperature, one for each mode of measurement. Furthermore, theoretical ideas do not relate directly to observational ones. A statement about electrons doesn’t have any direct observable consequences. It has such consequences only in conjunction with other scientific propositions which will typically themselves involve further theoretical concepts. Thus a claim about the mass of an electron will typically require supplementation by an auxiliary hypothesis about its charge (and much else besides) before it has an observable consequence, because what one measures is the ratio e/m of the charge to the mass of the electron. The relation between theory and observation is not piecemeal but is holistic. For this reason there is no hope of making an equation of the form “electrons = X” for an observational X. More generally theoretical claims are not reducible (equivalent) to observational ones.

5.2 The meaning of scientific and religious language

One might adopt one of two responses to the problems mentioned, both invoking a distinction between theoretical language and observational language and their semantics. According to the first option, a strict instrumentalism, sentences involving theoretical terms are strictly meaningless. Theories function solely to produce accurate empirical predictions (predictions concerning the observed), so the literal meaningfulness of theories is of no significance. However, the literal meaningfulness of theoretical language is difficult to square with both the phenomenology of science (the language seems meaningful) and the fact that the language is treated as more than gobbledygook when drawing inferences from theories to observational consequences. Thus the second option, the double language model, countenances a more liberal approach to semantics, allowing a different kinds of semantics for theoretical terms. Observational terms get their meaning via a direct correlation with observable things and properties. Theoretical terms get their meaning holistically via their theoretical relations with one another and via connections with observational propositions.

Let us now return to the theological case. The proposal we were considering was some equation of the form “God = X”. In the scientific case we found that either (as for operationalism) a multiplicity of such proposals each of which had a legitimate claim to translate ‘temperature’ (hence requiring a multiplicity of kinds of temperature), or we found that no plausible equivalence is available because of the holistic nature of

scientific theory. The first of these problems has an analogue. The different kinds of thermometer each explain our temperature judgments. Correspondingly we might regard our belief in God as explained by our possessing ideals or have a capacity or need for love or a desire to be at one with the world and nature. In which case there is a multiplicity of proposals for X in “God = X” (God is the Sum of our Ideals, God is Love, God is Nature). That seems to imply a multiplicity of Gods if there is more than one source of religiosity. The extent to which the second problem, the failure to find any reduction, arises in the theological case depends on the extent to which theological doctrines are bound up with one another. There are other theological concepts that need to be dealt with, not just God, such as (in Christianity) sin and the Trinity. If there are relatively few such concepts and the relevant doctrines are not too complex and interwoven, then it might be possible to find reductions for the other theological concepts too. Even so, the task looks daunting. The doctrine of the Trinity tells us that God is threefold and that one of the parts of God was killed for the remission of our sins. If we take, e.g. God=Nature, this requires us to find three aspects of nature, to regard one as ‘sacrificed’ to redeem our sins, where ‘sin’ (and ‘redemption’) are given appropriate reductions also.

A rather different third kind of problem arises for the theological case. The antirealist’s task is to reduce language T to language O. ‘T’ might be ‘theological and ‘O’ ‘ordinary’, or ‘T might be ‘theoretical’ and ‘O’ ‘observational’. Some sentences will be pure T sentences, using only T terms (plus perhaps logical and mathematical language). Some sentences will be mixed sentences, and some will be pure ‘O’ sentences. A successful reduction must reduce not only the pure ‘T’ sentences but also the mixed sentences. The mixed sentences are a potential cause of particular trouble because the ‘O’ components of mixed sentences do not get reduced. Thus when we reduce the T terms their reductions must fit with the O terms in such a way that the mixed sentences, with the T terms replaced by their reductions, continue to make sense. This is not an especial obstacle for scientific antirealism but is a serious problem for theological antirealism.

Let us look at the scientific case first. Here the proposed reduction draws on the fact that good theories should successfully explain and predict the observable facts. At the same time the mixed statements of science are themselves concerned with explanatory, predictive and causal relations between theoretical and observable states of affairs. So one should expect the proposed reductions to fit well with the mixed statements. Thus a proposed reduction of electron might be ‘trace of kind *E* in a cloud chamber’ and a mixed statement might be ‘electrons are correlated with phosphorescence in a cathode ray tube’. The combination of the two ‘traces of kind *E* in a cloud chamber are correlated with phosphorescence in a cathode ray tube’ is not especially problematic.

Many religious claims are also mixed—indeed there are clearly more mixed propositions in the Bible than purely theological propositions. Of the mixed claims many concern the actions and attitudes of God. However, the bases of the proposed reductions, that is the motivations for religious belief (ideals, love, need for significance) do not directly relate to the non-theological components of mixed sentences (“... made the Earth”). Thus there is a mismatch between the proposed reductions of the theological components and the non-theological components in mixed sentences as can be seen by considering “the Sum of our Highest Ideals made the Earth”. Indeed because

so many of the mixed sentences in the theological case concern actions and attitudes, no reduction will be satisfactory that reduces ‘God’ to anything other than a person-like entity. For even ‘Love loves us’ is a nonsense.

While atheists may welcome such a conclusion, metaphysical/semantic antirealists are typically motivated by a desire to make religious and theological claims come out, by and large, as reasonable. Consequently, if, for example, the Nicene creed is to make sense and even be reasonable (without returning to realism) the antirealist must take one of two courses: (i) retain the suggested reductions (or one of them) and maintain that ordinary, non-religious language, when employed in a religious context, may be being used without its normal semantics. (ii) reject the reductions suggested and regard theological language as having its own semantics, not reducible to non-theological language, but not semantically realist either. I shall consider these two responses in the subsequent subsections.

5.3 Metaphor

As regards (i), the most obvious way of taking the non-religious language used in religious context to have a non-standard semantics is to regard such talk as metaphorical. In metaphorical talk the same terms are being used as one finds in literal talk, but the propositions expressed are not the propositions expressed when the same sentence is used literally. The view that some talk in religious contexts is metaphorical is a familiar one. An early step in this direction was Aquinas’ doctrine of analogy whereby certain ordinary terms when applied in theological contexts do not have exactly their ordinary meanings but rather some analogical extension of those meanings. Even in Aquinas’ day it was not held that every claim of the Bible must be interpreted literally. (Later, the inconsistency of Galileo’s discoveries with the literal truth of certain Biblical passages was not, as is commonly supposed, an insuperable obstacle to the acceptance of his theories by the Church.) We may also note that apophatic theology is founded on a related doctrine, that of the *via negativa*—the only literally true statements about God are all negative, telling us what God is not.

However, the view we are considering goes beyond the limited medieval application of analogy and metaphor. Because mixed claims are ubiquitous in religion, it requires that pretty well all religious statements are metaphorical. And this is full-on metaphor rather than analogy. For Aquinas requires an analogical use of ‘good’ to apply to the perfectly benevolent creator, but it remains analogical because God is still person-like. But once ‘God’ is reduced to a non-person analogy can no longer play a role.

The mixed nature of so much religious talk and the need to treat all of it metaphorically are major differences with antirealism in science. However there are some views about science that are not all that far from this. One might maintain that for various reasons we cannot really understand the world. For example, one might maintain in a Kantian vein that our conception of the world is so filtered through our unavoidably human or even cultural categories and concepts that the resulting image cannot be held to be a picture of a human-independent world. Or one might reflect on the fact that science shows that nature is ultimately quantum in nature and that the paradoxes of quantum theory show that we just are unable to understand quantum reality. Or one might argue that because our language is unavoidably vague but that reality cannot be

vague, our language cannot express adequately the way reality is. These views might lead one to Kantian idealism—science is not about human-independent nature but is about our conception of nature. A different though related response is to regard science as consisting of models. Models are not intended as pictures of reality. Models may in some respects correspond to reality, but it is not possible to say how. Rather the function of models is to organise our scientific thinking. In this sense models are akin to metaphors. A good metaphor may be informative, but it is impossible to say how. It is certainly not descriptive. The thought that religious talk is metaphorical may be inspired by roughly similar reasons. The transcendence of God may mean that it is impossible to say much that is a true description of the way God really is. Aquinas' doctrine of analogy starts from this position and the metaphorical account of religious language may be seen as an extension of this.

5.4 Non-realist semantics

The second option, (ii), regards theological terms as irreducible and having their own, non-realist semantics. The work of Paul Tillich and Don Cupitt may be seen as instances where projectivism has led to a non-realist understanding of religious language.⁹

One extreme is to regard religious terms as having no semantics at all. We have considered the version of instrumentalism that maintains the same for scientific language. It is worth noting that an historically key motivation for both views is the same, viz. the verification principle that the meaning of a statement is its method of verification. Even theoretical statements of science cannot be directly verified and there is clearly no direct verification for theological statements. Whether science and religion can survive this depends on finding a function for science and religion that does not depend on the language they employ being meaningful. Such functions must be non-cognitive—they must not involve the contents of scientific/religious statements being the object of propositional attitudes (such as belief), because the meaninglessness of the language means that such statements have no contents. In the case of science the function is prediction with respect to observables. It is questionable whether science could fulfil this function with a strictly meaningless language. In the case of religion it may be different. It would not be much different if one thought that the point of religion was also explanatory, as Fraser and other early anthropologists have maintained. For then it is proto-science. Whereas if one maintains that the purpose of religion is expressive then the verificationist claim that religious language is strictly meaningless may not be so damaging. A. J. Ayer (1971: 142-4) gives an account of ethical language in expressive terms and one may extend the account to religion also. Ayer (1971: 152-3) himself notes that many theists may be willing to accept the conclusion that religious statements are strictly meaningless.¹⁰

Verificationism is no longer regarded as tenable. So the less extreme option is to regard religious language as having some semantics, only not the same semantics as, say, talk about ordinary people and their actions. Such a view is expressed among

⁹See Tillich (1957) and Cupitt (1980).

¹⁰Tillich's (1957) account of religious language as symbolic may be regarded as falling into the same category of expressivist accounts of language.

Wittgensteinians by saying that the grammar of religious language is different from the grammar of everyday language and that the superficial similarity between the two is misleading (and the source of philosophical problems), and is supported by the claim that grammar is related to form of life and the religious and everyday forms of life are clearly very different.¹¹ A key claim of this form is that ‘God’ is not a singular term. That is, ‘God’ should not be understood as the sort of term whose function is to refer. (It could have that function yet fail to refer, as does ‘phlogiston’ in science.) In particular, therefore, ‘God’ does not refer to any supernatural person; an utterance of “I believe that God exists” by a religious person should not be construed as analogous to “I believe that Princess Anastasia is alive” uttered by an historian. One problem for the double-language model in the philosophy of science is that it is not possible to draw a sharp dividing line between the observable and the unobservable, and hence there is no corresponding sharp dividing line between observational and non-observational/theoretical language. However, the claim that there is a distinct semantics for the non-observational requires a sharp division. Either a term refers or not; there is no halfway house. A similar problem arises in the religious case. There is good reason to suppose that Jesus of Nazareth and his disciple Simon (aka Peter) as well as Saul of Tarsus (aka Paul) actually existed. At the very least one can ask that question in a purely historical, non-religious sense. So, clearly, ‘Jesus’, ‘St Peter’, and ‘St Paul’ are singular terms. Christians will assert the following “Jesus is the son of God”. If ‘Jesus’ is a singular term, then so is ‘the son of God’. Similarly a pious Catholic will pray to God, the angels, and saints in a similar way, and possibly to all in the same prayer. Indeed the phrase ‘all the angels and saints’ is a common one in Catholic liturgy. It is difficult to see how the semantics of ‘saints’ and ‘angels’ could differ such that the first is general term covering certain kinds of person and the latter is not, especially as the proposition ‘some angels are saints’ is supposed to be true for Catholics. Note, however, that a distinct reason for supposing that there we cannot divide observational from theoretical language is the claim that observation terms are theory-laden. That is, observational terms are themselves partly theoretical in that applying them implies the acceptance of some theory (if only a rather low level theory). It seems less plausible to claim that the bulk of our everyday language is in part implicitly religious also.

5.5 The current status of metaphysical and semantic antirealism

Metaphysical and semantic antirealism are no longer popular options among the bulk of mainstream philosophers of science. Most accept that the semantics for scientific language is not different in kind from that for the remainder of our descriptive talk. that scientific claims are therefore truth-apt, and that if those claims are true then there exist entities and properties that are not perceptible. Not all these philosophers are ready to accept that all our most warranted scientific claims should be regarded as true. For many some kind of epistemological antirealism is tenable. Metaphysical/semantic theological antirealism is less unpopular than its scientific counterpart. One reason, I suspect, is that the corresponding arguments have not been explored with the same degree of analytic rigour as in the scientific case. A rather different reason is the existence

¹¹C.f. Phillips (1993a,b). For a response to Phillips see Scott and Moore (1997).

of a trade-off between metaphysical and epistemological antirealism. Let us say that in a certain domain of discourse many people wish to make claims of the form “there are Xs”, “Xs are thus and so” for some specific ‘X’. Let it be that it is widely thought that if we take the semantics of ‘X-speak’ in a face-value, realist way, there are reasons to be sceptical concerning our ability to know such claims to be true—the evidence for Xs is poor, there are a priori reasons why we could not know about Xs even if they did exist, there may even be evidence against Xs. It would seem therefore that we should hold that those who assert “there are Xs” and “Xs are thus and so” are not entitled to make such assertions and we should not make them ourselves. However, the following move is left open to those who do not wish to reject the widely-made assertions. One may deny that the utterances in question should be given a realist semantics at all. Once given some alternative semantics (or metaphysics) it may turn out that the sceptical problems fall away, for example because ‘Xs’ are, given this semantics/metaphysics, much easier to know about, or even because this semantics suggests that it is a mistake to think that X-talk is cognitive at all (it is not truth- or knowledge-apt).¹² Berkeley’s strategy is explicitly of this kind. He acknowledges that Locke’s philosophy leads to scepticism if ‘corporeal body’ is understood in a materialist fashion. And so in order to avoid such scepticism Berkeley declares that corporeal bodies are not material but are ideas. Thus one strong motivation for metaphysical antirealism is the avoidance of scepticism that would otherwise arise. However, in the philosophy of science it is highly debatable whether any sceptical problem arises even on a realist metaphysics. On the face of it many scientific theories are extremely well supported by the evidence, and so supporters of scientific realism as regards both metaphysics and epistemology think that they are on firm ground. The theological case is somewhat different. For here the strength of the evidence would appear, *prima facie*, to be rather weaker. There is considerable room for reasoned denial of the existence of God. Consequently there is a correspondingly greater motivation to avoid scepticism (i.e. agnosticism or atheism) by resorting to a metaphysical or semantic antirealism. In the next section I examine whether the appearance of greater epistemological strength in the case of science as opposed to religion is indeed the case.

6 Epistemological antirealism in science and theology

Above I did not distinguish between religion and theology, because in so far as both involve propositions, the subject matter of the propositions largely overlaps and thus the metaphysical questions are the same for both. However, now we are discussing epistemology, it will be useful to remember that the two are distinct, in that a religion is a set of practices, normally institutionalised, of which, as typically understood, beliefs form a part but only a part. It is not an essential part of religion that it seeks to justify, add to, or even explain its beliefs. Theology, however, is a form of enquiry. Its concern is to understand the subject matter of religious belief, to subject those beliefs to scrutiny, usually with the intention of justifying them. In the process it aims to add to our understanding of God, heaven, sin, or whatever it is that may be the subject matter

¹²In my view much of the motivation for Cupitt’s antirealism comes from a desire to retain a commitment to orthodox theological claims. C.f. Ross White (1994: 20).

of religion. Thus the epistemological questions that may be aimed at theology are not necessarily the same as those aimed at religion, although they do overlap.

6.1 Inference to the Best Explanation

Several of the antirealist objections to claims for scientific knowledge focus on the forms of inference employed—primarily enumerative induction and Inference to the Best Explanation. We can put the problem of induction aside since it concerns inferences to universal generalizations. While there are theological generalizations of interest ('all humans have souls') the most significant theological and religious claims are existential, that there is a God, with certain properties. Of greater interest are objections to Inference to the Best Explanation (IBE), for one of the classic arguments for the existence of God, the Argument from Design, takes precisely this form. It is worth noting, however, that while objections to IBE in the case of science are general, casting doubt on the ability of IBE to give us knowledge on any occasion, or on any occasion where the conclusion concerns the unobserved, in the theological case the objections are more specific. Thus Hume did not object to IBE in general; rather he complained that the particular inference, from perceived order in the world to a perfectly good and powerful creator, is a weak one. It is a weak one because the proposed explanation is a poor explanation of the evidence—or at least far from being the best one. Thus, if Hume is right, the Argument from Design fails even by the standards of those who do accept IBE as a route to knowledge.

Nonetheless, there are analogies between the general rejection of IBE by scientific antirealists and Hume's rejection of the particular application of it. Hume cites other explanatory hypotheses that would explain the data equally well, including hypotheses that are original to Hume. The general complaint against IBE is that however many explanations we have considered there will always be others we have not considered, and that among these will be explanations that are just as good as our preferred explanation. Another general complaint against IBE was that 'goodness' is too subjective a notion to be a sound basis for inference to truth. Again, one may employ a particular version of this complaint without necessarily subscribing to the general version. Thus it may be objected that the theological hypothesis favoured by the Argument from Design is likely to seem to be a good one only to those with strong religious inclinations to start with.

6.2 The No Miracles Argument and the Pessimistic Meta-Induction

In favour of scientific realism some philosophers have raised the No Miracles Argument, that the success of science would be a miracle (i.e. implausible) if our best scientific theories were not largely true or near to the truth. This is a generalized version of Inference to the Best Explanation that sees science as more-or-less unified and as generally very successful in making predictions (including predictions about how pieces of science-based technology will behave). The best explanation for this success, so this argument goes, is that the processes of science lead us to the truth. In particular, science is a process of inquiry that continues to generate ever more successful theories. Thus the NMA can be seen as an argument to the effect that the method or methods of

science are reliable and thus that its theories are likely to be true or nearly so. Since religion is not a form of enquiry one would not expect the NMA to have an analogue. However, since theology is a form of enquiry, there could be an analogue to the NMA. The problem here, however, is that the argument would not have the same immediate plausibility that it has in science, for the simple reason that theology does not have spectacular successes to point to. Of course this may be debated and we may ask, what counts as success? After all, most scientific predictions are those that can be assessed only by scientists employing other scientific theories, and it may be argued that by theologians own criteria theology has been successful also. One difference, however, is science-based technology, for here the successes can be judged by the layman. It doesn't take a scientist to verify that radios can receive signals, that nuclear power stations produce electricity, that computers compute, that we have put a man on the moon and got him back again, and so forth.

Arguing in the opposite direction to the NMA, the pessimistic meta-induction (PMI) is a general argument against the inference from the success of theories to their truth on the ground that in the past successful theories have often been falsified in due course. One way of appreciating the PMI is this. Either our current most successful theories are false or they are true. If false, then success in science does not yield truth. Now consider the position if they are true. Such theories will typically have replaced successful predecessor theories. These older theories and their current replacements are inconsistent, hence if the current theories are true then the successful theories of the past are false. Thus again we have example of successful but false theories. Either way we can see that the success of a theory does not show it to be true. Again, any analogous argument would be directed against theology rather than religion. The PMI could be mounted most straightforwardly against theology if we can see an historical succession of theological theories (positions, view etc.) that (i) are each regarded as successful in their time, and (ii) are mutually inconsistent. Finding sequences such that (ii) holds is perhaps not difficult. For example, the antirealist and non-theistic theologies of many contemporary theologians are clearly inconsistent with the realist theologies of the past. In Protestant countries the Reformation was an exchange of one theology for another inconsistent with it. And even within the various Protestant traditions (and to an extent in the Catholic traditions) there have been changes of view over time. It needs also to be shown that (i) is true, that the relevant theories were regarded as successful by theological lights in their own time. This is perhaps more difficult to ascertain. one might measure success by general acceptance—but over how wide a range of theologians? Nonetheless, this may not matter for the theological sceptic. For if we cannot identify any theological view as successful, then that itself constitutes a reason for rejecting the capacity of theology to lead to the truth. In effect one can mount a synchronic PMI: at any time there are a variety of mutually inconsistent theological view on offer. None has a much greater claim to success than any other. Consequently the relevant degree of success achieved cannot be a sign of truth. This is just a more formal way of putting an often made complaint. There are many religions and even more theologies on offer. If we ignore fringe religions and theologies, we have no good reason to favour any one of the remaining well-established, widely supported and intellectually well-developed theologies as opposed to the alternatives.

Note that such a synchronic PMI does not have a significant scientific counterpart.

Most scientists and philosophers of science would agree that where an analogous situation arises, the right response is a suspension of belief. Where there are well-developed rival theories each successful to some degree but none more successful than the other, the right attitude to take is that one should not believe any one of them to be true. Thus, for a while at least, it would be have been proper not to take a view on whether the demise of the dinosaurs was caused by (i) meteor impact, (ii) volcanic explosion, (iii) Darwinian superseding by better adapted mammalian species. But for much of science there are theories that are almost universally accepted and which are far more successful than their (now moribund) rivals. In such cases a synchronic PMI cannot get off the ground. In this connection the cultural difference between science and religion/theology is often noted. The favoured theories of science are almost universal amongst well or even moderately developed societies. But this is far from being the case with theological theories. It is sometimes countered that the ubiquity of scientific agreement is just an aspect of western cultural imperialism. But this would not explain (i) why there is widespread agreement on which theories are successful, and (ii) why there is religious difference despite cultural imperialism. (Many imperialists tried harder to impose Christianity through missions than they did to impose western science.)

Not all realists subscribe to the NMA. One reason is that it treats science as a unified whole, whose method or methods are shared across all disciplines. But if that is not the case, it would be misleading to argue from the widespread success of science to the reliability of the methods of science and thence to the truth of its theories. And many naturalistically inclined philosophers of science believe that there is no unique scientific method but rather a plurality of methods some of which may be fairly specific to a particular discipline. This view, while it prevents the realist from deploying the NMA nonetheless also protects her from the PMI. The fact that we can find some sequences that show that success is not correlated with truth, is no reason to deny that success is ever a guide to truth, if we think that in different areas of science the methods of theory justification are different. Plausibly a parallel move could be made with respect to the application of the PMI to theology. Is theology a unified discipline that employs the same methods whether in Catholic or Protestant theology, whether in Christian or Muslim theology and so forth? Arguably not, and if one denies the unity of theology, then the disagreement between theologians of different traditions is not a strong reason to reject all theology.

6.3 Social constructivism

The diversity of religious and theological belief, in contrast to relative agreement on much of science, suggests that a social constructivist view of religion and theology might be better supported than a social constructivist view of science. In both cases the constructivist will appeal to social or political reasons in explaining the existence of the institutions and indeed of their particular practices and beliefs. The implication is that such explanations show that religion and theology are not responses to the existence of God and science is not a mechanism for uncovering objective truths about nature. After all if theology were a reliable way of coming to know about God, why is there such widespread disagreement? That disagreement is best explained by the existence of cul-

tural diversity. The social constructivist has a more difficult time accounting for the remarkable cross-cultural agreement on scientific matters. Even if there are disagreements about the newest theories there is usually near-universal acceptance of better-established theories, and about techniques and instruments. As mentioned, the efficacy of the objection from religious and theological diversity does seem to depend on the assumption that cognitive methods of religion/theology are shared by the differing religions and their theologies. It also depends upon the divergences being significant. So as regards religion, some may argue that Jews, Christians, Muslims and perhaps others are indeed worshipping the same God and that to focus on differences in detail ignores the widespread existence of religion and 'spirituality' which can, allegedly, be seen as evidence for the existence of a supernatural being. The social constructivist critique does not necessarily depend on diversity of practice and belief, for even a widespread consensus can have a social explanation. When faced with the NMA, the social constructivist can point to the fact that much of the so-called predictive success of science is itself success only by the standards of science itself. For this reason realists will point to the technological success of science as providing external evidence of success. The problem for theology is that there is little that can fill the analogous function to technology. If prayer were provably efficacious in bringing about the prayed-for outcome, or if believers were protected from disasters that afflict non-believers, that might be analogous evidence. But there is little such evidence beyond suggestions that believers are on average slightly healthier and happier than non-believers.¹³

7 The aims of religion, theology, and science

Scientific realists regard the aim of science as being the truth, or increasing nearness to the truth, or even knowledge. antirealists may diverge from this by rejecting this claim to some degree or other. Theological antirealists may make a parallel move with respect to religion, although the matter is little discussed with respect to theology itself. Science and religion are however clearly different in this respect, even as far as the realist is concerned. While, on the face of it, science is primarily in the truth business, religion is deals with a lot else besides. The main purpose is not the acquisition or inculcation of beliefs but is the worship of God in liturgy, communication with God through prayer, doing God's work on Earth, and so forth. Even so, it is clear that this perspective requires a core of belief in religion, that God exists, that He wants us to worship in such and such ways, that He wants us to act in certain ways. Theology, at least in its origin, may be seen as a systematic attempt to get such beliefs right.

Those kinds of semantic antirealism that deny that sentences of scientific or religious language are truth-apt will require us to deny that science or religion, as the case may be, are in the truth business at all. That would seem to be a consequence of the views of Tillich and the Wittgensteinians. However, one might still hold that science and or religion do not aim at truth, even if the claims are truth-apt. But if the claims of scientists and religious people do not aim at truth, then those claims cannot be held to be the expressions of belief. Thus van Fraassen (1980) thinks that scientists do not

¹³But they are also more likely to be overweight Ferraro (1998). There may be many explanations for what is a marginal effect.

believe their favoured theories, they merely accept them. Even so, acceptance has some connection with belief—it implies the belief that the theory in question is empirically adequate. Thus a scientist may well believe that the observable predictions of her theories are true. However, since religion is not in the prediction business, this kind of substitute for belief is not available. Thus the point of religion must be expressed in terms that are not cognitive at all (they may be expressivist, for example). The fact that religion involves so much liturgy and other kinds of individual and social practices that do not directly require belief makes it relatively easy to think that propositional elements of religion are not beliefs at all.

One problem facing such views is that many of the individuals concerned will declare that their attitude is one of belief or some related attitude that is also truth-apt or cognitive (e.g. faith, or partial belief). It is difficult to deny that Christianity is concerned with belief given the central role of the creed in its liturgy. In van Fraassen's case he can claim that the individuals in question have just confused the cognitive attitude they do have, acceptance, with a related one they do not have, belief. That may be a difficult enough position to maintain, but it is more difficult to hold that a traditional Christian is mistaken in holding that they really do believe (in an everyday sense) in God and that their attitude is in fact one of expressing some kind of need or desire or is in fact some kind of *sui generis* mental attitude specific to religion and bound up with engaging in religion as a practice (à la Wittgenstein).

One may make a distinction between the aim of science/religion as socially embedded practices and the attitudes of its practitioners. So scientists and religious people do believe in the truth of their theories and in the existence of God. But the aims of science and religion are not concerned with the truth of those beliefs but rather, for example, with the maintenance of the social position of the relevant elites. This need not show that those beliefs are false. One may admit that technology aims at the production of objects and techniques useful for certain purposes. Nonetheless, insofar as technological research does involve beliefs, those beliefs had better be true if technology is to achieve its aim of giving us effective products. Similarly the social position of scientists may also depend on their producing true theories. The role those theories play in technology is one reason why this is so. The internally critical nature of science is another. New ideas are subject to scrutiny at various stages that will weed out at least the most egregiously false ones. And since careers depend on successful problem solving, old ideas, even if long-standing, will be rejected if they impede that process (Kuhn 1962). Thus the scientific realist may be able to concede that science is in the business of promoting the interests of (leading) scientists without admitting that this casts any doubt on the ability of science to produce true theories. For the ability of science to produce truth is part of what promotes the interests of successful scientists. On the other hand there are few analogous mechanisms in the case of religion that would link the social position of priests and other benefitting from religion (e.g. aristocracies, governments) to the truth of religious belief. It is true that in some religions priests are supposed to help win wars, cure diseases, and ensure good harvests. But the links are sufficiently indirect that failure could often be explained away. And modern religions reject the thought that they have any role in changing the world in that way. Thus religion is more vulnerable than science to claims that its function is not concerned with or even related to the truth.

8 Conclusion

Many of the same themes crop up in debates between realism and antirealism whether in the philosophy of science or in the philosophy of religion. There are nonetheless various asymmetries. In both cases metaphysical and semantic antirealism faces serious difficulties, but these difficulties are more severe in the case of theology than science. Nonetheless, it seems that metaphysical/semantic antirealism is largely an historical phenomenon in philosophy of science, maintained by few serious philosophers of science today, whereas that kind of antirealism is fairly widely favoured among theologians.

There are two explanations for this apparently paradoxical state of affairs. First, the relevant issues have been explored more deeply and for a longer time in science than in theology and consequently the obstacles are more keenly felt. The second explanation lies in the trade-off between metaphysical/semantic antirealism on the one hand and epistemological antirealism on the other. As discussed, one way of avoiding scepticism about Xs is to re-construe what Xs are or what 'X' refers to. We have seen that there are quite general grounds for epistemological antirealism in the philosophy of science, some of which would carry over into theology (e.g. rejecting IBE in general would undermine not only belief in scientific theories but also the Design Argument). However, theology suffers from quite particular grounds for doubt as well. So even if one does not object to IBE in general one might agree with Hume that the Design Argument is a poor inference. One might think that even if not all theories are radically underdetermined by the data, the claim that God exists and has such and such properties is one that is badly lacking in evidence to support it strongly let alone convincingly. Since doubt and even disbelief are clearly reasonable and perhaps well-grounded options in religion, even without recourse to sophisticated philosophical arguments, the claims of scepticism are especially pressing in the case of religion. Consequently there is a greater pressure in the theology to accept the trade-off between the two kinds of antirealism and to evade the pull of agnosticism or atheism by resorting to metaphysical or semantic antirealism. Berkeley made just this trade-off because he believed that metaphysical realism in the form of materialism leads to scepticism about physical ('corporeal') entities which in turn would lead to doubts concerning God's existence. But if there are quite independent doubts about God's existence one might have to extend the metaphysically antirealist manoeuvre to God himself.

References

- Ayer, A. J. 1971. *Language, Truth, and Logic*. Harmondsworth: Pelican.
- Boyd, R. 1991. On the current status of scientific realism. In R. Boyd, P. Gasper, and J. D. Trout (Eds.), *The Philosophy of Science*, pp. 195–222. Cambridge, Mass.: MIT Press.
- Comte, A. 1892. *Cours de philosophie positive* (5th ed.). Paris: Société Positiviste.
- Cupitt, D. 1980. *Taking leave of God*. London: SCM Press.

- Ferraro, K. F. 1998. Firm believers? religion, body weight, and well-being. *Review of Religious Research* 39: 224–244.
- Feuerbach, L. 1846-1866. *Ludwig Feuerbach's Sämmtliche Werke*. Leipzig: Otto Wigand.
- Kuhn, T. 1962. *The Structure of Scientific Revolutions*. Chicago: University of Chicago Press.
- Phillips, D. Z. 1993a. On really believing. In *Wittgenstein and Religion*, pp. 33–55. London: Macmillan.
- Phillips, D. Z. 1993b. Searle on language-games and religion. In *Wittgenstein and Religion*, pp. 22–32. London: Macmillan.
- Psillos, S. 1999. *Scientific Realism: How Science Tracks Truth*. London: Routledge.
- Putnam, H. 1975. *Mathematics, Matter, and Method: Philosophical Papers vol.1*. Cambridge: Cambridge University Press.
- Ross White, S. 1994. *Don Cupitt and the Future of Christian Doctrine*. London: SCM Press.
- Scott, M. and A. Moore 1997. Can theological realism be refuted? *Religious Studies* 33: 401–418.
- Tillich, P. 1957. *Dynamics of Faith*. London: Allen and Unwin.
- van Fraassen, B. 1980. *The Scientific Image*. Oxford: Oxford University Press.