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Voluntarist Theology at the Origins of Modern Science:

A Response to Peter Harrison

There is a historiographical tradition which links two different theological approaches to God's creation of the world (and his subsequent relationship to it) with correspondingly opposed attitudes to the most reliable scientific epistemology. These two approaches are usually referred to as voluntarist and intellectualist theology. The beginnings of this historiographical tradition can be traced back to the 1930s with the appearance of a series of three papers by the philosopher and theologian Michael Beresford Foster (1903-1959), published in the philosophical journal, *Mind*, and the appearance in 1936 of Arthur O. Lovejoy's "Study of the History of an Idea", *The Great Chain of Being*.[1] Foster drew attention to the role of what he called voluntarist theology in the rise of science in the early modern period, and attributed this to the encouragement voluntarism provided for empiricist approaches to an understanding of the natural world. Lovejoy's *Great Chain of Being*, by contrast, focussed on the theological approach to which Foster's voluntarism was opposed, and which is usually called "intellectualist". Although failing to reach the heights, in terms of influence, that Robert K Merton's *Science, technology and society in seventeenth-century England* of 1938 went on to enjoy, among those interested in the relations between science and religion the voluntarism and science thesis has proved as enduring as the Puritanism and science thesis.[2]

But it has been under a notice to quit from Peter Harrison since the appearance of his "Voluntarism and early modern science", in 2002.[3] What I want to do in this paper,

therefore, is to attempt to re-affirm, contrary to Harrison's claims, that voluntarist

theology was an important component, or at least concomitant, of the natural

philosophy of some of the leading thinkers of the early modern period. But the first

thing to do is to say a few words about what is meant by intellectualist and voluntarist

theologies.

Intellectualist versus Voluntarist Theologies

The differentiation between these two approaches to the nature of God's Providence,

the nature of his relationship to the world, can be seen to originate among the Early

Fathers, but it is usually regarded as a feature of theology in the Middle Ages,

beginning perhaps with Peter Damiani (1007-1072), whose *Disputation on whether*

God is omnipotent of about 1067 is seen as a clarion call for voluntarists, and Peter

Abelard (1079-1142), whose *Introduction to theology*, written about fifty years later,

reached conclusions that are now seen as representative of intellectualist theology.[4]

Put simply, the rivalry between these two theological perspectives derived from

differing views about the competence of the newly recovered Aristotelian philosophy

in underwriting Christian theology.[5] The dangers of the philosophical approach were

all too often seen in conclusions that seemed to deny the omnipotence of God. The

major illustration of this is provided by the condemnation of various Aristotelian

propositions by the Bishop of Paris in 1277. The list of proscribed propositions

included many which used philosophical assumptions to deny God's ability to

perform physical operations, such as moving the whole world system two feet to the

left, or creating a vacuum.[6]

Etienne Tempier, the Bishop of Paris, simply wished to reject the relevance of

Aristotelian philosophizing to any questions about what God could or could not do.

But there had already been discussions of the nature of God's omnipotency within

Christian theology in which it was generally acknowledged that God's omnipotency

could not be threatened, or undermined, by pointing out that he could not do

something which was logically impossible—such as claiming that he could not create

a married bachelor. Similarly, these discussions dismissed paradoxical claims that he

was incapable of creating a weight so heavy that he himself could not lift it.

Nevertheless, these discussions, pacé Tempier, seemed to some to allow Aristotelian

philosophical conclusions to be applied to God's creation without undermining God's

omnipotence. If Aristotle said creation of a vacuum was impossible then it did not

undermine God's omnipotence to say God could not create a vacuum—for these

thinkers it was as though creation of a vacuum was not simply a physical

impossibility, but a *logical* impossibility. Others, however, especially after the

condemnation of 1277, begged to differ. For these dissenters their rivals, the

intellectualist theologians, placed too much emphasis upon logic in determining God's

actions. Consequently, they insisted that God did things not according to his reason

but to his will.

Now, the point of this was not to insist that God did things in an irrational way, but

merely to ensure that supposedly logically-driven conclusions did not get out of hand.

The fear was that Aristotelian logic would lead to conclusions about God which either

diminished his omnipotence, or more subtly, which implied that he was not fully in

control of his own actions, because he always had to follow fully the dictates of reason, and acted, therefore, out of necessity.

In emphasising the role of God's will in guiding his actions, the point was to suggest that God could do as he pleased, and was not constrained by all of the extended range of 'logical' necessities that their rivals wanted to claim (clearly, they accepted that there were logical contradictions that God could not counter, but they would not extend these to every one of Aristotle's philosophical conclusions).[7] God's freedom of action was thus upheld. Needless to say, however, there was a wide range of opinions about how far to take this emphasis upon the arbitrary will of God. For some it was just a way of avoiding an extreme Aristotelianism of the kind shown by Siger of Brabant (*c*. 1240–*c*. 1283) and Boethius of Dacia (*fl*. *c*. 1277), while still supposing that God freely chose to act in accordance with Aristotelian logic.[8] Others, however, seemed to take voluntarism itself to extremes, as a way of denying that we could ever presume to understand God. William of Ockham (*c*. 1288–*c*. 1348) is usually regarded as the representative of this kind of voluntarism. For William it was conceding too much to the compelling power of philosophy to expect God to conform to his own nature, and so William insisted that God could, if he chose, do something that was counter to his nature.[9]

Intellectualists, by contrast, saw the emphasis upon God's freedom of will as having dangers of its own. William of Ockham's claim is a case in point. But even at a less extreme level, voluntarism seemed to deny intuitions about what was morally right and wrong. Intellectualist theology always took it for granted that God, because of his

goodness, always did what was for the best. He was able to decide what was best by the use of his reason.

Voluntarists, however, were suspicious of such claims and where they might lead, and so they tended to deny that there were pre-existing or eternal principles of right and wrong to which God had to conform (again, the concern of the voluntarist is that God has no room to manoeuvre but has to conduct himself in accordance with presupposed principles of morality). The point of the denial was not to suggest that God acted immorally, but that he acted freely, and that the way he acted allows us to determine, retrospectively, what we should consider to be right and wrong. But for intellectualists this was an outrageous suggestion, implying that anything might be considered good, even something evidently devastatingly evil. So, one of the traditional ways of characterising the differences between intellectualists and voluntarists is to say that the intellectualist believes that God does what is good, but the voluntarist says that what God does is good. The first implies that the good is an absolute concept independent of God, the latter carries no such implication.

Now, in the historiography of science these two theologies have been linked, especially in the early modern period, to different approaches to scientific epistemology and methodology. The intellectualist emphasis upon God's reason is seen to go hand-in-hand with rationalist natural philosophies. Since God followed the dictates of reason in creating the world, we can reconstruct, so to speak, God's thought processes, and arrive by a rational process at an understanding of the world. By contrast, the voluntarist emphasis upon God's freedom of operation is associated with a belief in the radical contingency of the natural world and the concomitant

belief that we can only understand God's creation *a posteriori*, by examining it and drawing empirically-based conclusions as to what he actually did, or as to what kind of world he created.

It is this fairly prominent feature of the historiography of early modern science that Professor Harrison has attacked and I wish to defend. But one thing we should consider before I launch into this is the question as to why early modern natural philosophers might have turned to this time-honoured theological debate at all.

Amos Funkenstein pointed to what he called a secular theology which arose in the sixteenth and seventeenth centuries. It was developed and promoted chiefly by leading natural philosophers, and Funkenstein provided an excellent commentary on the way major theological ideas were developed by various of these thinkers, so that, as he said, "Never before or after were science, philosophy, and theology seen as almost one and the same occupation."[10] What Funkenstein did not do, however, was explain *why* the thinkers he discussed felt it was so important for them to enter into what is often highly recondite theology.

But it seems to me that it isn't hard to see why. We simply have to bear in mind that these new secular theologians are developing new natural philosophies which are radically different from scholastic Aristotelianism. But Aristotelian natural philosophy has long been regarded as an important handmaiden to the Queen of the Sciences, Theology.[11] In seeking to overthrow Aristotelianism, therefore, the new philosophers felt it was incumbent upon them, either to separate natural philosophy from religion, or to show how their new philosophy could take over as a better hand-maiden to

religion.[12] This enterprise was especially important given the changes that religion itself was undergoing at this time. Aristotelianism was associated with Roman Catholicism and some Protestant thinkers at least recognised a need for a new natural philosophy to support their new kind of religion.[13] But perhaps what made the enterprise of developing a new secular theology even more urgent was the perceived rise of atheism, and the fact that the new philosophies were all too often seen, by the devout, as providing support for the atheist worldview.[14] There was, therefore, a determined effort by many of the leading natural philosophers, all of whom seemed to have been highly devout, to show the usefulness of their new philosophies for combating atheism, and confirming the existence of God.[15]

With regard to voluntarist theology in particular, it might also be supposed that its revival was greatly stimulated by the advent of Spinoza, whom Jonathan Israel has called "the supreme philosophical bogeyman of early Enlightenment Europe". [16] Although Spinoza's theology is highly original, it can be seen to bear marked similarities to intellectualist theology. Indeed, it might be regarded as intellectualist theology taken to its logical extreme.[17] It should be noted, however, that the need to choose between voluntarist and intellectualist theologies had already been put on the philosophical agenda before Spinoza's emergence—possibly by the Protestant Reformers; possibly (at least as far as natural philosophers were concerned) by Descartes.[18] But the full history of this has yet to be written.

It is against this background, then, that the old distinction between intellectualist and voluntarist approaches to understanding God's Providence re-emerged. Given this background, it is my contention that the real concern of the natural philosophers

involved is not with the niceties of intellectualism or voluntarism for their own sakes, but rather with the best strategy for combating atheism or for showing the compatibility of their natural philosophies with whatever religious orthodoxy to which they felt most committed.[19] In other words, they do not always conduct themselves as though they are unbendingly committed to voluntarism, or intellectualism, but they take a pragmatic line, cutting their cloth to suit the prevailing conditions. This is going to have implications for some of Harrison's strictures against early modern voluntarism.

Addressing Aspects of Harrison's Critique

We read things according to our own lights, so when I first heard of Peter Harrison's rejection of the fairly standard claims about the role of voluntarist theology in early modern science, I assumed that he would offer a reconsideration of, and an alternative account of, the various controversies which had been characterised by historians as disputes over the nature of Providence inspired by voluntarism on the one hand and its opposite, intellectualist theology, on the other.[20] This expectation was based on my own work on voluntarist theology in early modern science, in which I had focussed on controversies between the Cambridge Platonist, Henry More, who rejected voluntarism, and the Presbyterian divine, Richard Baxter, and the natural philosopher, Robert Boyle, both of whom upheld it (or so it seemed to me). I'd also looked into the controversy between Bishop Edward Stillingfleet and John Locke on the notion of thinking matter, although I hadn't published anything on this.[21] What's more, I was able to recognise the theological background to these controversies thanks to work by other scholars on the famous controversy between Leibniz, chief exponent of

intellectualist theology, and Samuel Clarke, speaking for Isaac Newton, and representing the voluntarist side of the debate.[22] But Harrison's paper, "Voluntarism and Early Modern Science" (2002), stated at the outset that he believed the "voluntarism and science thesis is fatally flawed and its major contentions should be abandoned."[23] As I began to read it, therefore, I was eager to learn how Harrison would interpret the differences between, say, Leibniz and Clarke (the obvious example to choose), without recourse to the theological differences represented by intellectualism and voluntarism. And, of course, I wondered whether this alternative reading would be applicable to the disputes between More and Baxter, and More and Boyle, and therefore undermine my own accounts.

Harrison bases his objections on five main difficulties, which he believes undermine the standard claims in the historiography of voluntarist theology. Firstly, he suggests that there were voluntarists who were not empiricists. Secondly, in his own words, "the central categories of 'voluntarism', 'necessity', and 'contingency' are used with such imprecision and ambiguity as to render many versions of the thesis virtually meaningless." Thirdly, he suggests that claims about the impact of medieval voluntarism on early modern thought are "simply wrong." Fourthly, he suggests that a number of early modern empiricists who are used to support claims about the importance of voluntarism "were not voluntarists in any significant sense of [the] word." Finally, he suggests that voluntarism is in fact inconsistent with the physico-theological motivations of the majority of early modern natural philosophers. These difficulties lead him to insist that the "voluntarism and science thesis" is "fatally flawed and its major contentions should be abandoned."[24]

This approach, which draws up a typology of what it means to be a voluntarist, and then seeks to determine who fits this typology, seems to me to be too rigid to capture the messiness of historical reality. Consider, for example, the fact that while presenting the case for his first objection: that there were voluntarists who were not empiricists, Harrison concludes that since Descartes was a voluntarist and a rationalist, the "inexorability of the logic of a connection between voluntarism and empiricism" breaks down.[25] There may be intellectual historians out there who have talked in terms of the inexorable logic of particular positions, but if there are, I can't imagine them holding this position for long. Indeed, I can imagine myself, or other intellectual historians, using the example of Descartes precisely to show that there is no necessary connection between voluntarism and empiricism, there is no inexorable logic which connects them. Nevertheless, I would want to go on, it remains true to say that the defence of empiricist approaches was often associated with a theological position that can be characterised as voluntarist.

Although Harrison concedes that Descartes's position is "idiosyncratic" and certainly puzzling, he refuses to allow the validity of claims, notably by Margaret Osler, that Descartes was really an intellectualist.[26] The point here is that Descartes famously pronounced that God freely created the so-called eternal truths, such as the truths of mathematics, the laws of nature, and so forth, and could have made them different: 2 plus 2 might have been made equal to 5. This looks voluntarist through and through, but Descartes went on to invoke the immutability of God to enable him to insist that God could not change the eternal truths. Furthermore, as Gary Hatfield has pointed out, Descartes then claimed that God created our minds with innate knowledge of the eternal truths that he did create, and so we are able to know the essences of things *a*

priori.[27] This no longer looks like voluntarism. Voluntarists more typically wish to

avoid allowing *a priori* knowledge of the world, which is associated with rationalism

and (usually) with the view that God was constrained by reason in the act of

creation.[28] Once Descartes insists that it is possible to arrive at an understanding of the

world by a process of pure reasoning, he seems to be conducting himself as an

intellectualist in his theology, not as a voluntarist. This was Osler's point and I have

more sympathy with it than Harrison; after all, as Gary Hatfield has pointed out,

Descartes does not tell us whether God created the truth of his own immutability.[29]

Descartes wanted to insist that God has to conform to his own immutability whether

he wants to or not. This is an eternal truth, it seems, that God could not have made

different.[30] Furthermore, it plays an absolutely crucial role in Descartes's physics,

allowing Descartes to draw rational conclusions as to how the world must be, because

God could not have done things differently.

Burt I believe it is wrong to try to reach a determination of this issue—whether

Descartes was a voluntarist or an intellectualist—in absolute or essentialist terms. As I

said earlier, always with regard to the intellectual positions adopted by specific

thinkers, we need to consider the context within which they developed any given

intellectual position. Hatfield provides an account of Descartes's discussion of the

creation of the eternal truths which sees it as an attempt to separate theology from

philosophy, and thus give Descartes free reign to develop a philosophical system

which can be non-Aristotelian without thereby being anti-Catholic. I won't pursue the

complex details of Hatfield's argument here, but suffice it to say that it is perfectly

consistent with the evidence and at least plausible. It provides, therefore, a way of

understanding why Descartes could write like a voluntarist with regard to one aspect

of his philosophy, albeit a highly idiosyncratic voluntarist, and write like an intellectualist in all other respects. The Descartes that Hatfield presents was not driven by the demands of inexorable logic, but by considerations about how best to persuade his learned contemporaries to abandon Aristotelian natural philosophy and to embrace his.[31] We cannot say, therefore, whether Descartes was really a voluntarist or really an intellectualist, but given this, we certainly cannot use his example to dismiss all claims about the putative intellectual affiliation between voluntarism and empiricism.

Let's move on to Harrison's second difficulty, that in the literature on this topic "the central categories of 'voluntarism', 'necessity', and 'contingency' are used with such imprecision and ambiguity as to render many versions of the thesis virtually meaningless." I don't want to look in detail at all the points Harrison raises under this heading. Many of his points, alas, do point to sloppy thinking in the scholars who have tried to discuss these issues. I can't make excuses for all of these, but suffice it to say that if the errors of individual scholars invalidated general arguments, then I could invalidate differential calculus just by attempting a few calculations!

As a critic, Harrison is by no means obliged to sort out the correct from the incorrect in the historians whose views he is rejecting. However, it is easy to see that some of Harrison's arguments depend not on the inherent lack of cogency of the voluntarist thesis, but on his exploitation of the confusions perpetrated by some of its proponents. Take the case of occasionalism. As Harrison points out, P. M. Heimann, in his 1978 paper, "Voluntarism and Immanence" equated voluntarism and occasionalism.[32] Harrison can now take delight in pointing out that "this characterization of voluntarism hardly serves the thesis well." For example, Malebranche, the leading

occasionalist, is thoroughly intellectualist in his theology (he is also, of course, a Cartesian rationalist). And indeed, Harrison goes on to point out that occasionalism is "quite consistent with intellectualism".[33] What Harrison does not point out, however, is that, Heimann's views notwithstanding, occasionalism is intrinsically *incompatible* with voluntarism. The correct response to Heimann's claim that voluntarism and occasionalism go hand in hand is *not* to conclude that the voluntarism thesis is fatally flawed, but that Heimann mistook the implications of voluntarism, or of occasionalism.

The point about occasionalism is that it depends on the insistence that the concept of secondary causation is somehow incoherent and inconceivable. Only God, therefore, is capable of causative action. Any sign of secondary causation, according to the occasionalist, is really evidence for the direct intervention of God.[34] For a contemporary voluntarist this is exactly the same as saying that God cannot make matter active, or that he cannot make matter capable of thinking.[35] In short, it is a circumscription of God's omnipotence based on what a human thinker decides to be impossible. For the voluntarist, what Malebranche, or any other philosopher, claims about the incoherence of secondary causation is beside the point. If God wishes to make a moving brick capable in its own right of breaking a glass window, he can. God does not have to surreptitiously break the window for the brick, because he lacks the wherewithal to make the brick do it itself. For the voluntarist, occasionalism is based on a pernicious absurdity (that God has to directly involve himself in absolutely everything that happens in the world, no matter how corrupt or degrading), deriving from an arrogant proscription of what God can and cannot do.[36]

A similar response could be made to Harrison's comments about the distinction between God's absolute and ordained power, and the ways in which this distinction might or might not have been used in discussions of miracles.[37] Harrison mingles fair comment against sloppy thinking by various scholars, with a stratagem of taking what those scholars say as a legitimate representation of voluntarist theology and using it to undermine the thesis. By these means Harrison is able to conclude that the voluntarism thesis is completely unhelpful because, not just putative voluntarists but "virtually all seventeenth-century thinkers held that the creation was… dependent on the will of God."[38] Again, I would simply say to this that voluntarism is misrepresented here. No voluntarist would have felt the need to insist that the world was dependent on the will of God, or we might say, the continued good will of God, who could withdraw his support at any time—as Harrison says, this was a universal assumption in the Christian tradition. Voluntarists did, however, feel the need to insist that with regard to the creative act, God simply did as he willed, or as he wished. The point was that God's will was not constrained to choose a particular kind of creation by pre-existing absolute conceptions of what was good, or what was possible according to some philosophical position. So, when Isaac Newton wrote of God's "creating, preserving, and governing of all things according to his good will", he was not necessarily invoking voluntarist beliefs, but when he wrote, "The world might have been otherwise then it is (because there may be worlds otherwise framed then this) Twas therefore noe necessary but a voluntary & free determination that it should bee thus", he almost certainly was.[39]

Eventually, Harrison comes to the nub of the matter and concedes that it can still be asked, even in spite of the example of Descartes (and presumably, although he does

not explicitly say so, in spite of all he himself has said up to this point), "whether most of those committed to experimental philosophy were voluntarists in the sense that they considered God's creative will *not* to have been determined by his goodness and wisdom."[40]

Instead of pointing to infelicities of expression in modern commentators, Harrison now points to seemingly intellectualist statements made by supposedly voluntarist thinkers.[41] I want to take here the same line as I did when discussing Descartes earlier. Deviation from a standard version of voluntarism by a particular thinker should not lead us as historians to suppose they were not in the least influenced by voluntarism, but that they had reasons of their own for introducing these qualifications, or for being inconsistent with a position they had taken on one or more other occasions. What those reasons were could only be determined (if at all) by looking at the local context, the thinkers own interests, and the interests of those to whom they might be affiliated at the relevant time. It would surely be remarkable, would it not, if every voluntarist subscribed to 39 articles of voluntarist theology, or a set of Jesuitical "Rules for thinking with the Church, voluntarists, for the use of", without any room for manoeuvre. I couldn't help thinking, as I read Harrison's attempts to show how various reputed voluntarists were not voluntarists, how easy it is to show that hardly anybody was a Puritan, and nobody was a Latitudinarian. And we all know that not even Jesus was a Christian, and Newton was never a Newtonian, or if he was, then none of the eighteenth-century Newtonians were really Newtonians.[42] Say what you like, these categories and others like them, whether they were conceived and used by the alleged members of those categories or not, remain useful to historians. Always, however, they must be used with caution.

Again, let me take just one example from Harrison's discussion. Harrison provides a

brief quotation from one of Newton's religious manuscripts which he says reveals "an

unmistakeably intellectualist position".[43] I'll quote this in the longer version which

Harrison provides in a subsequent paper of his devoted entirely to Newton's

voluntarism. This is from a manuscript entitled "Of the Church" (about 1710):

> Thou shalt love the Lord thy God with all thy heart & with all thy soul & wth
>
> all thy mind. This is the first & great commandment & the second is like unto
>
> it: Thou shalt love thy neighbour as thyself. On these two commandments,
>
> saith Christ, hang all the Law & the Prophets, Matt 2.37. And on these two
>
> also depends all the Gospel. For these are the laws of nature, the essential part
>
> of religion which ever was and ever will be binding to all nations, being of an
>
> immutable eternal nature because grounded upon immutable reason.[44]

Harrison glosses this in his Newton paper by saying that moral obligations are said by

Newton to be grounded in "the revealed commands of God and in the natural order",

and says that the laws of nature mentioned here originate from "God's immutable

reason." Of course, I'm a biased reader, but I don't see any mention of God's reason

here, only human reason. We are, after all, talking about commandments which are

said to be the essential part of religion, and binding on all nations because they are

grounded upon immutable reason. It seems clear, therefore, that what Newton has in

mind here are natural laws in the sense of moral laws which are accessible to

everyone's reason, and so knowable to members of all nations, not just those fortunate

enough to be born in Christendom. This notion of natural law has as long a pedigree

as the concept of laws of nature in physics. So, Newton is saying nothing about

physical laws here, and, I would say, nothing about God's reason. He merely uses the term immutable in this context to avoid any suggestion that human reason might be said to be different in different cultures (reason he insists "ever was and ever will be binding on all nations"). If he is talking about nations, he cannot strictly be laying claim to commandments of an eternal nature, and so must mean eternal in a relative sense; likewise, immutable should be taken to refer to the immutable nature of what passes for reason among humans.

But, I don't think I need to persuade readers of the truth of my reading. It's enough for my purposes to cast some doubt on Harrison's claim that this quotation presents "an unmistakeably intellectualist position". Besides, this is only one quotation and there are many others which seem to suggest Newton was a voluntarist. Consider the quotation I provided earlier ("The world might have been otherwise then it is (because there may be worlds otherwise framed then this) Twas therefore noe necessary but a voluntary & free determination that it should bee thus"). This comes from one of Newton's alchemical manuscripts and it is by no means clear to me, from the immediate context, why Newton wanted to say this at this point, but say it he did.

Returning to the earlier paper on "Voluntarism and early modern science", Harrison next tries to undermine the voluntarist thesis by suggesting that natural philosophers are unlikely to subscribe to a view of nature in which God continues to intervene by arbitrary decree, and by 'arbitrary' Harrison spells out that he means "in the sense of capricious or random".[45] Indeed, such a view would make their attempts to establish a natural philosophy completely futile. This certainly would be true if voluntarist

theology did carry these implications. But Harrison is either attacking a straw man here, or at best a misreading of voluntarism perpetrated by less than careful historians.

The whole point of the alleged alliance between voluntarism and empiricism is that it is not possible to reconstruct *a priori* God's thinking as he decided how to create the world. Kepler clearly thought it was possible to think God's thoughts after him, as did Descartes, and Leibniz.[46] But their assumptions were based on the belief that God was constrained to create the world in accordance with the same rational processes available to them. Since both Descartes and Leibniz knew that void space was a contradiction in terms, because extended substance was matter, they could tell that God could not have allowed any vacuum in the world. He had no choice in the matter. Similarly, since Henry More knew that matter was by its very nature inert, he could confidently conclude that not even God could give matter its own activity. Conversely, since immaterial spirit was by its very nature active, and since activity was a feature of the physical world, More was able to pronounce with some confidence that God had created not only inert bodies, but also active immaterial beings.

Those who subscribed to a voluntarist theology, however, denied that God could be second-guessed this way. The only way you could tell whether God had allowed void space or not was to see if you could find a vacuum, or failing that, to see if you could make one. This was the only way you could tell because, according to the voluntarist, God could have gone either way on the issue. He had a free choice in the matter. God's creative power was in this sense arbitrary—nobody, as far as I can tell, ever said that he created things capriciously and randomly (although, if it is true that

William of Ockham believed that God did not have to conform even to his own nature, then he could not have denied that God might have behaved this way). Similarly, the only way you could tell whether matter could be active or not was to empirically investigate bodies, or perhaps to try to isolate an immaterial spirit and to investigate how such an immaterial entity was able to move matter. Once again, the assumption of the voluntarist was that there can be nothing in the nature or essence of matter itself which makes it impossible for God to choose to make it inherently active.

This brings us to Harrison's final objection to voluntarism—that the emphasis upon the capricious and random nature of God's interaction with the world is incompatible with the undeniably rich tradition of natural theology.[47] But the alliance between voluntarism and empiricism which I've just outlined, brief as it is, is clearly highly conducive to the natural theological enterprise. If you want to know something about God beyond what you can learn from revelation, you must study his creation. Voluntarism not only supports natural theology, it effectively requires it.

Anyway, by the time I had read up to this point in Harrison's critique I was getting increasingly impatient to see how he intended to account for the differences between, say, Leibniz and Clarke (as manifested in their famous epistolary exchange via Princess Caroline) without reference to the different approaches of the intellectualist and the voluntarist. Having read Harrison's comments so far, I still had no idea how he was going to do this. It was with some dismay, therefore, that I realised that I'd reached the end of the article, and that this crucial aspect of the story was left unexamined.

Accordingly, I was delighted to see, a couple of years later, that Harrison had turned

his attention this way once again in an article concentrating this time on the issue of

Newton and voluntarism.[48] I immediately assumed that he had been saving his

discussion of the Leibniz-Clarke correspondence for separate treatment in this article.

But, alas, I was disappointed once more. Harrison certainly mentions this

correspondence here and there throughout the Newton article but he does not examine

it systematically, and seems oblivious to the fact, as he denies that Newton was a

voluntarist, that the correspondence reveals, above all else, a clash between the

differing worldviews of the voluntarist and the intellectualist.[49]

Similarly to his earlier more general case, Harrison prefers to examine whether

Newton can be seen as a voluntarist in his theology, by considering whether he

conforms to four "claims" which Harrison discerns in the modern promoters of the

voluntarism and science thesis. At the outset, Harrison announces that Newton can

only be said to have subscribed to two of these claims and that in subscribing to these

two "he was simply asserting what virtually every other seventeenth-century

philosopher held, including those not usually numbered amongst the voluntarists."[50]

We have already seen, when examining the quotation from Newton's "Of the

Church", that Harrison believes that, with regard to moral laws, Newton clearly aligns

himself with intellectualists, rather than voluntarists. He reiterates that claim here with

the help of another quotation, in which Newton declares that God, "freely willing

good things", always acts in accordance with the laws he himself has set down,

"except where it is good to act otherwise". Seizing on the first phrase, Harrison takes

this to mean that "God thus wills good things—things are not good because God wills

them." But a voluntarist would never have been able to say that God freely wills bad things, or even that he freely wills indifferent things. The point is that what God freely wills, that is to say, what God wills without any constraints on his freedom of operation are (by definition) good things.[51]

With regard to Newton's suggestion that God can deviate from his own laws "where it is good to act otherwise", Harrison again insists that God is here guided by what is good, not by his "inscrutable will". But it seems to me that Newton is referring to miracles here, and is alluding to what is usually called God's ordained power (*potentia ordinata*), a short-hand reference to the fact that God constrains himself to act in accordance with the laws of nature and other regularities he imposed on the world at its creation. For the intellectualist, and for Descartes (whatever his position might be said to be), God's submergence of his power into the *potentia ordinata* manifested in his creation rigidly constrains him henceforth, and miraculous interventions are declared (by the intellectualists) to be impossible. For the voluntarist, by contrast, God's *potentia ordinata* merely represents a self-denying ordinance, which he can choose to over-ride at any time. So, for Newton, God acts "according to accurate laws, as being the foundation and cause of the whole of nature, except where it is good to act otherwise." The question immediately arises, however, as to why God might choose to over-ride the normal course of nature—what are the exceptions which might lead God to "act otherwise" than in accordance with the laws he originally laid down? Clearly, the voluntarist would not suggest, in response to this question, that God might do this on a whim (remember, the use of the term "arbitrary" in discussions of voluntarism does not mean "random and capricious"[52]), nor that God might do it for evil purposes. He might choose to do it, for example, to prove his

existence to doubters, or in the case of the miracles of Jesus to impress upon onlookers that God was here incarnated in human form. In short, as Newton (the voluntarist) said in the manuscript under consideration, God might choose to perform a miracle where it was good to do so.[53]

Harrison discusses the concept of God's *potentia ordinata*, and the concomitant concept of *potentia absoluta*, in the penultimate section of his paper, and in so doing returns to this same quotation.[54] Needless to say, while discussing this quotation in the context of the distinction between God's absolute and ordained powers, Harrison offers an alternative reading to the one I have just offered above. According to Harrison, the overriding of physical laws of nature, in the case of a miracle, "is not an abrogation of anything that God himself has ordained" but is merely an unusual or untypical event that might seem miraculous to the onlooker, but is nevertheless explicable in natural terms. In other words, a miracle does not have to be explained solely in terms of God's absolute power, overriding his ordained power, but can be seen as part of the general course of nature (albeit a very rare and unusual part), brought about by his ordained power.

To clarify this distinction, consider the famous example of Shadrach, Meshach, and Abednego in Nebuchadnezzar's fiery furnace.[55] God might have ensured that the three boys were not burned in the flames simply by saying "Let not the boys be burned", as he had said "Let there be light" at the creation, and there was light. This would be a case of God's absolute power overriding his ordained power, by which fire always burns. Alternatively, God might have ensured that the boys were not burned by contriving from the creation that at breakfast on the crucial day they were going to eat

something, or a marvellous combination of things, that would affect their metabolism in such a way that they would perhaps sweat a special substance which protected them from burning (it is implicit in this account that this special sudor is held to operate in a natural way, and would protect anyone from fire if it could be bottled!). This would be an example of a miracle produced within the terms of God's ordained power, without any need to consider his direct intervention with overriding absolute power.[56] It may have been brought about by secondary causes but it still counts as a miracle by dint of the fact that it brought about circumstances specially required by God.

According to this latter possibility, then, a miracle can be something which takes place in accordance with the course of nature. Of course, the general course of nature in question will involve something which happens extremely infrequently, or indeed once only. The classic Newtonian example here would be the view that the Noachian flood was brought about by the passing near the earth of a massive comet.[57] Here we have a miraculous event which is nevertheless brought about by a comet endlessly orbiting the sun since the creation, and whose movements conformed to the universal principle of gravitation, and whose effects are entirely natural when they come close enough to the earth to have significant consequences.

Harrison has insisted that Newton's concept of miracle does not rely on the intervention of God's absolute power, but is always explicable in terms of God's ordained power.[58] For the most part, I believe Harrison is essentially right about this (although I believe there is some evidence that Newton was not always as consistent as Harrison would like him to have been).[59] Unlike Harrison, however, I find this concept of miracles perfectly compatible with voluntarist theology. There is nothing

in voluntarism, after all, that precludes explanation of miracles in terms of secondary causes. On the contrary, the emphasis upon explanation *a posteriori*, which affiliates voluntarist theology with empiricist approaches to an understanding of the physical world, would lead us to expect an explanation of miracles, wherever possible, in terms of secondary causes. In the case of the three boys in the fiery furnace, we can imagine a 'Newtonian' onlooker wishing to take samples of their sweat after they come out of the furnace, or scrutinising no end of other possible factors, with a view to explaining how the miracle occurred—*not* to explain the miracle away, but to understand by what secondary means God wrought the miracle.

Harrison seems to want to reserve the interpretation of miracles entirely in terms of God's ordained power as somehow incompatible with voluntarist theology. But, as far as I can make out, he tries to do this simply by suggesting that the proponents of the voluntarism and science thesis always claim, firstly that miracles are brought about only by God's absolute power, and secondly that God's absolute power is always manifested in terms of God's direct intervention. If there are such proponents of the voluntarism and science thesis out there, then they are wrong, and Harrison is right to take them to task. Newton was never committed to the view that miracles were cases of primary causation by God himself, as we can see from his speculations about the purposes of comets. Having said that, there is evidence to suggest that he did not commit himself either to the view that miracles could only be performed through God's ordained power. Part of the evidence for this would be the quotation we have already considered, where Newton says that God operates "with all things according to accurate laws, as being the foundation and the cause of the whole of nature, *except*

where it is good to act otherwise" [my emphasis].[60] Consider also his very famous

pronouncement in the wonderfully rich final Query in the *Opticks* that God

> is more able by his Will to move the Bodies within his boundless uniform
>
> Sensorium, and therefore to form and reform the Parts of the Universe, than
>
> we are by our Will to move the Parts of our own Bodies.[61]

The fact remains, *pace* Peter Harrison, that there is a world of difference between

Descartes, Spinoza, and Leibniz, who all wanted to deny the possibility of miracles on

philosophical grounds,[62] and Newton who was explicit in allowing them, and would

certainly have wanted to deny the possibility of establishing on *a priori* grounds that

God could not perform miracles.[63] Certainly, Newton's position was a hard one to

defend in coherent philosophical terms, and may even have been ultimately

untenable,[64] but the 'logic' (I do not say "inexorable logic") of his voluntarist

theology would have made him shy away from any claims that seemed to

circumscribe the omnipotence of God (such as denying that God could perform a

miracle), just as his commitment to natural philosophy would have made him shy

away from rescinding secondary causation and glibly invoking primary causation.[65]

Accordingly, Newton threaded a fine line between his commitment to the unrestrained

omnipotence of God and to the belief that God usually operated in terms of secondary

causes. Indeed, it might further be noted that the lack of philosophical cogency in

Newton's attitude to miracles is in itself support for the claims that he was a

voluntarist in his theology. Intellectualist theology is generally characterised in

rigorous philosophical terms, and has been represented by powerful philosophical

thinkers like Descartes (if I may be allowed to include him as an intellectualist),

Spinoza, and Leibniz.[66] Voluntarist theology, by contrast, was defended by those who

were much less enthralled by philosophical arguments, and by those who refused to allow reason to dictate to theology (and indeed in the Middle Ages, the voluntarist approach could even be said to be characteristic of anti-intellectual groups in the Church, those who perhaps admired Bernard of Clairvaux more than they did Peter Abelard).[67]

Anyway, being blissfully unaware of my own preoccupations as an expectant reader, Harrison never did turn, in either of his papers, to a consideration of the major disputes in the history of science which hinged, at least partly, upon the differences between voluntarist and intellectualist theology. So, let me turn now to a brief look at those I have in mind. My aim in doing this is not to suggest that every voluntarist and every intellectualist thought the same way, and subscribed to exactly the same worldview (the intellectualist Henry More, for example, wanted to allow the existence of void space because he saw it as a clear example of immaterial being, but the intellectualist Leibniz would not allow the existence of vacuum[68]). Rather, my aim is simply to demonstrate that we cannot fully understand the disputes in question unless we recognise the fact that the protagonists were participants in a long tradition, not just in natural philosophy, but also in Christian theology. Let me here make explicit, therefore, what is implicit throughout this next part of my talk: that if Harrison really wants to insist that the voluntarism and science thesis should be abandoned, he needs to give an alternative account of what is going on in these controversies.

Intellectualist versus Voluntarist Controversies

In each of the controversies I'm about to discuss, it seems to me that an ever-present pressing issue is the knowledge that atheism is a constant threat, and that, accordingly, the devout natural philosopher should show how his understanding of the natural world serves to establish the existence of God.[69]

Consider, for example, the dispute between Henry More (1614-1687) and Robert Boyle (1627-1691) about the validity of More's notion of a universal Spirit of Nature, which More held to be responsible for all activity in the physical world.[70] At some point early in his career, More decided that the best way to nip atheism in the bud was to make plain to everyone that there really are immaterial entities, and that there really is a spiritual realm, and therefore that the materialism of atheism is patently foolish. Being a Cambridge don, More seems to have believed that the best way to make the existence of immaterial spirit obvious to everyone was through a bit of recondite and high-powered philosophizing. The closest he came to speaking to the common man was by gathering supposedly well-attested stories of ghosts, witches, and the like, but otherwise he relied on developing notions of an absolute immaterial space, showing how the mechanical philosophy of Descartes was inadequate for explaining all physical phenomena, and developing the notion of a ubiquitous Spirit of Nature which was required to make the mechanical philosophy fully workable.[71]

More was so determined to make his claims unassailable that he invested huge effort in trying to persuade his contemporaries that matter was essentially inert and incapable of activity, and that therefore any signs of activity in nature had to be attributed to immaterial spirit, which was the only active substance in the world. More was already an intellectualist in his theology, because he equated voluntarism with

Calvinism, and rejected Calvinism because, according to More anyway, it denied absolute moral values, and seemed to suggest that anything God decreed was good, rather than, as More believed, that there are absolute values of goodness to which God had to comply.[72] Consequently, More made sure that his account of matter and spirit conformed to, and reinforced, his intellectualist theology. The up-shot was that, according to More, the distinction between inert matter and active spirit was another absolute. Not even God could make matter active, to do so would involve him in a logical contradiction. To make matter active, is as impossible as making matter without any extension—it is a contradiction in terms. Given that we see activity all around us in the world, we have to conclude that as well as matter, there must also be something active, and that must be something other than matter—ineluctably something immaterial.[73]

With regard to everyday physical phenomena, More developed the notion of the Spirit of Nature, which he described as the vicarious power of God in the world, thereby maintaining God's transcendence, while still contriving to show that even everyday physical phenomena testify to his existence. More even went so far as to provide his own accounts of various experiments recounted by Robert Boyle, to show how these experimental phenomena could only be understood on the assumption that a Spirit of Nature was at work.[74]

It was at this point that Boyle stepped in with his *Hydrostatical discourse occasioned by the objections of Dr Henry More* (1672). Now, of course, Boyle was keen to dismiss More's bad science, and to show that the Spirit of Nature was not required to account for the various experimental results More discussed. But, what's interesting

for our purposes is that Boyle didn't leave it at that. It is all too obvious that Boyle

wanted to dissociate himself from the underlying theology that was manifest in

More's writings. "Truth ought to be pleaded for only by Truth", Boyle insisted,

> so I take that which the Doctor contends for to be evincible in the rightest way
>
> of proceeding by a person of far less learning than He, without introducing any
>
> precarious Principle…

Boyle went on to point out that, after all, "the generality of Heathen Philosophers

were convinc'd of the being of a Divine Architect of the World" even though they

believed the world was "managed in a meer Physical way according to the General

Laws settled among things Corporeal, acting upon one another." They did not have to

ground their belief in a supposed Spirit of Nature.[75]

Boyle did not permit himself to indulge in extended theological discussion in the

Hydrostatical discourse, but he returned to this theme in his *Free enquiry into the*

vulgarly received notion of nature, which he finally published after years of delay in

1686. Boyle attacked many different antagonists in this book, but he clearly had More

in mind when he focussed upon those who believe Nature is

> an Immaterial Substance… the Grand Author, of the Motion of Bodies, (and
>
> that, especially in such familiar Phaenomena, as the Ascension of Water in
>
> Pumps,… the running of it through Siphons, and I know not how many
>
> others).[76]

Boyle's *Free enquiry* is a protracted attempt to examine and refute all the different

philosophies, and all the more popular ways of thinking, in which nature itself seems

to supplant God and to be used to explain physical phenomena. During the course of

this enterprise, therefore, Boyle can hardly refrain from presenting his own account of the nature of Providence, the nature of God's relationship to the world. In so doing, he consistently presents what I feel justified in calling "an unmistakeably voluntarist position". So, shortly after More has argued in print (1682) that God must act in accordance with

> mutual Respects and Relations eternal and immutable, and in order of Nature
>
> antecedent to any Understanding either created or uncreated.

Boyle goes into print (1686) to insist that:

> God is a most Free Agent, and Created the World, not out of necessity, but
>
> voluntarily, having fram'd It, as he pleas'd and thought fit, at the beginning of
>
> Things, when there was no Substance but Himself, and consequently no
>
> Creature, to which He could be oblig'd, or by which he could be limited.[77]

But Boyle wasn't the only one to take exception to More's intellectualist theology. Richard Baxter (1615-1691) had been quicker off the mark than Boyle, and had replied to More's major statement of intellectualist theology published in 1682 within a matter of months. Remarkably, the pretext here was to defend the idiosyncratic matter theory of the physician and natural philosopher, Francis Glisson (1599?-1677). Glisson's *Treatise on the energetic nature of substance* (1672) had argued on empiricist grounds that matter was not merely active, but that it actually displayed a complex 'life' of its own manifested in three faculties: perceptive, appetitive, and motive. For More this was

> not only a mistake but a mischief, it implying that the *Virtus Appetitiva* and
>
> *Perceptiva*, may be in a substance though Material which betrays much of the

succours that Philosophy affords to Religion in the points of the Existence of a

God and Immortality of the Soul.[78]

Similarly, it becomes clear pretty quickly that Baxter's concern is not really to defend

the complexities of Glisson's matter theory, but to denounce what he saw as More's

philosophically-based circumscription of God's omnipotence. Consider for example:

> I confess I am too dull to be sure that God cannot endue matter itself with the
>
> formal virtue of Perception: That you say the Cartesians hold the contrary, and
>
> that your writings prove it, certifieth me not… That Almighty God cannot
>
> make perceptive living Matter, and that by informing it without Mixture [i.e.
>
> without adding a separate active—immaterial—substance to it], I cannot
>
> prove, or I think you: Where is the Contradiction that makes it impossible?[79]

This parting question must have been especially annoying to More, since much of his

printed output since the early 1660s had been devoted to showing that there was

indeed a contradiction in making matter active. It was only by establishing that there

is a *logical* contradiction in the notion of active matter that More could declare it to be

impossible for God, *without* detracting from God's omnipotence. Philosophers and

theologians alike were agreed that it did not detract from God's omnipotence to

declare that he could not do what was logically impossible.[80] What this meant in

practice was that intellectualist theologians had to establish on philosophical grounds

that certain physical phenomena were conceptually impossible. In More's case, active

matter had to be as impossible as non-extended matter, otherwise his attempt to

establish the necessity for active spirits in the world could not run. More evidently

believed he had succeeded in this, but obviously Baxter was no more persuaded than

Boyle had been.[81] For Baxter, however, More's view threatened sound religion by making philosophical considerations take precedence over theology, or, more simply, by unjustifiably (as far as Baxter was concerned) denying God's omnipotence.

The same disagreement about what is and what is not conceptually impossible lies at the root of the controversy over thinking matter between Edward Stillingfleet (1635-1699), Bishop of Worcester, and John Locke (1632-1704).[82] This arose from Locke's sceptical discussion "Of the Extent of Human Knowledge" in Book IV of the *Essay*.[83] It is important to note that Locke never affirms that matter can think. His point is that, in spite of our presuppositions that what thinks inside of us is something immaterial, it is perfectly possible for God to make matter capable of thinking. Significantly, as well as referring to God, Locke also talks in terms of "Omnipotency"; we cannot tell, he says at one point, "whether Omnipotency has not given to some systems of matter fitly disposed, a power to perceive and think", and later he asks who could "have the confidence to conclude, that Omnipotency itself cannot give perception and thought to a substance which has the modification of solidity." [84]

Stillingfleet was by no means a dedicated follower of Henry More's but he evidently agreed with More that "the great ends of religion and morality are best secured by proofs of the immortality of the soul from its nature and properties."[85] In his dispute with Locke, therefore, he wanted it to be taken for granted that matter was by its very nature incapable of being active in its own right. If activity signifies the operation of immaterial substance then we are on the way to proving the immortality of the soul

based on its inherent nature, but this is jeopardized if Locke allows the concept of

thinking matter.

The fact that Stillingfleet did take it for granted that matter was essentially inactive

perhaps suggests that intellectualism was the dominant theology in the Anglican

Church, but this wasn't going to sway Locke:

> The question is, whether God can, if he please, bestow on any parcel of matter,
>
> ordered as he thinks fit, a faculty of perception and thinking. You say, you
>
> "look upon a mistake herein to be of dangerous consequence as to the great
>
> ends of religion and morality." If this be so, my lord, I think one may well
>
> wonder why your lordship has brought no arguments to establish the truth
>
> itself… [T]he world has reason to conclude there is little to be said against that
>
> proposition which is to be found in my book,[86] concerning the possibility that
>
> some parcels of matter might be so ordered by Omnipotence, as to be endued
>
> with a faculty of thinking, if God so pleased; since your lordship's concern for
>
> the promoting the great ends of religion and morality has not enabled you to
>
> produce one argument against a proposition that you think of so dangerous
>
> consequence to them.[87]

In so far as the Bishop does offer an argument, Locke elsewhere suggests, it is only to

declare the inertness of matter to be an essential property. But this, Locke points out,

is only to protect himself from the charge of denying God's omnipotence:

> Let us, therefore, if you please, suppose the form of your argumentation right,
>
> and that your lordship means, "God cannot": and then, if your argument be
>
> good, it proves, "That God could not give to Balaam's ass a power to speak to

his master, as he did, for the want of rational discourse being natural to that species"; it is but for your lordship to call it an essential property, and then God cannot change the essential properties of things, their nature remaining, whereby it is proved, "That God cannot, with all his omnipotency, give to an ass a power to speak, as Balaam's did."[88]

It seems to me, therefore, that if we wish to understand this controversy, we need to be aware of the fundamental differences between intellectualist and voluntarist theologies, and how these affect the philosophical positions of their subscribers. If Stillingfleet does not offer explicit arguments against Locke's position, it is because he is assuming that his readers already know his position and the reasons for it. Likewise, Locke does not have to enter into a theological preamble to set up his own position; he can simply jump straight to a discussion of God's omnipotence, knowing that many of his readers, fellow subscribers to theological voluntarism, will already be predisposed to agree with him.

This brings me, finally, to the controversy between Leibniz and Samuel Clarke. The dispute here is very rich and complex, and is further complicated by Newton's implacable hatred of Leibniz, which makes him unwilling to concede anything (or to allow Clarke to concede anything) to Leibniz. But there are marked similarities between this dispute and the earlier ones we have just looked at. As with the dispute between More and Boyle, much of it concerns the details of natural philosophy, in particular the nature of space, and the possibility of void, but it is easy to see that these are bound up with the theological positions of the two sides. Furthermore, these

theological positions are also bound up with differing beliefs as to how best to refute atheism.

As is well known, Newton generally favoured the strategy of leaving some physical phenomena unexplained, to make it possible to invoke a God of the gaps. In this, he was setting his own physics up as more godly, more religiously sound, than the Cartesian philosophy which he saw as "made on purpose to be the foundations of infidelity"[89] To emphasise the anti-atheist point, of his philosophy he even suggested that, unlike the Cartesian system where God was only required at the very beginning, in his system God's intervention was required in an on-going way to ensure its steady continuation. It was this which led Leibniz to scornfully declaim in the opening salvo of the correspondence, that "God Almighty wants to wind up his watch from time to time: otherwise it would cease to move."[90]

Like More, Leibniz seems to think that the best way to persuade the common man to abandon his increasingly ungodly ways is to provide him with recondite but none the less forceful arguments about the nature of God. Newton's God, as far as Leibniz is concerned, is too inadequate to carry any force of conviction. As far as Clarke is concerned, however, Leibniz's God is too much a philosophical construct, and not enough of a living presence in the world. It is Leibniz's position which is likely to lead to atheism:

> The notion of the world's being a great machine, going on without the
>
> interposition of God, as a clock continues to go without the assistance of a
>
> clockmaker; is the notion of materialism and fate, and tends, (under pretence

of making God a supra-mundane intelligence,) to exclude providence and

God's government in reality out of the world.[91]

It's easy to see Clarke's point. Leibniz's God is, to use a modern idiom, "stitched up"

by Leibniz so that he can only do what Leibniz requires him to do. For example, in a

discourse worthy of Dr Pangloss, Leibniz shows why God cannot allow a vacuum:

> I lay it down as a principle, that every perfection, which God could impart to
>
> things without derogating from their other perfections, has actually been
>
> imparted to them. Now let us fancy a space wholly empty. God could have
>
> placed some matter in it, without derogating in any respect from all other
>
> things: therefore he has actually placed some matter in that space: therefore
>
> there is no space wholly empty: therefore all is full.[92]

This is bound up, of course, with Leibniz's principle of sufficient reason, by which

single principle, Leibniz says, "one may demonstrate the being of God, and all the

other parts of metaphysics or natural theology".[93]

Much to Leibniz's annoyance, however, Clarke insists on saying that the sufficient

reason for things might simply be "the mere will of God."[94] In one of his letters to

Princess Caroline, Leibniz makes it clear that when Clarke "claims that something can

happen by a mere will of God without any motive", he can't tell whether Clarke

genuinely fails to understand the principle of sufficient reason because of his lack of

philosophical acuity, or whether he is merely wilfully pretending not to see the point.

Leibniz himself is never in any doubt, as he says in another letter to Caroline, "that

even God cannot choose without having a reason for this choice."[95]

When writing to Clarke, however, Leibniz tries to insist that he does allow God freedom of choice, although he cannot bring himself to do so without maintaining that God is directed by his reason:

> The author objects against me, that if we don't admit this [God's] simple and mere will, we take away from God the power of choosing, and bring in a fatality. But the quite contrary is true. I maintain that God has the power of choosing, since I ground that power upon the reason of a choice agreeable to his wisdom.

Leibniz even goes on to admit this is a fatality of a kind, but a kind which can be said to reveal the "wisest order of providence", and is very different from "blind fatality or necessity". [96] But this still isn't good enough for Clarke, who in his reply insists that

> the will of God can freely choose and determine itself, without any external cause to impel it; and that 'tis a perfection in God, to be able so to do…[97]

Again, Leibniz tries to clarify the issue, but in so doing he makes it all the more clear that God, according to intellectualist precepts, is constrained by truths which are somehow independent of God and co-eternal with him:

> God is never determined by external things, but always by what is in himself; that is, by his knowledge of things, before any thing exists without himself.[98]

God is determined by what he knows to be true even before he creates anything. This is a classic intellectualist position, opposed by the voluntarist claim that God can create arbitrarily, unconstrained by any supposedly eternal uncreated truths. As Clarke says, of Leibniz's position:

This argument, if it were good, would prove that whatever God can do, he cannot but do… Which is making him no governor at all, but a mere necessary agent, that is, indeed no agent at all, but mere fate and nature and necessity.[99]

It is Leibniz, therefore, who offers hostages to atheists, not Newton with his watchmaker God.

In his final reply to Leibniz (which remained unanswered due to Leibniz's death), Clarke exploited a traditional voluntarist attack on intellectualism, namely that it depended upon the assumption that our reason is equivalent to God's, and that what we think is reasonable, must also be held to be reasonable by God. Clarke exposed this in another attack on Leibniz's principle of sufficient reason:

If it is possible for God to make or to have made two pieces of matter alike, so that the transposing in situation would be perfectly indifferent; this learned author's notion of a sufficient reason falls to the ground. To this he answers; not, (as his argument requires,) that 'tis impossible for God to make two pieces exactly alike; but, that 'tis not wise for him to do so. But how does he know, it would not be wise for God to do so? Can he prove that it is not possible God may have wise reasons for creating many parts of matter exactly alike in different parts of the universe? The only reason he alleges, is that then there would not be a sufficient reason to determine the will of God, which piece should be placed in which situation.

As Clarke points out, this last point is an "express begging of the question", and serves only to lock God back into conforming to Leibniz's principle of sufficient reason.[100]

I said before embarking on this brief survey of voluntarist/intellectualist controversies that if Harrison really thinks we should abandon the voluntarism and science thesis, then he should indicate how we are to understand the differences expressed in these controversies, and others like them. In view of the evident similarities between the positions taken up by each of the sides in these disputes, it is surely unsatisfactory to say that there is no common intellectual background against which they are to be understood. It seems highly unconvincing to suggest that the antagonists simply developed their respective positions afresh each time. The only plausible alternative, therefore, if we are to abandon the voluntarism and science thesis, is to provide a different 'key' for revealing, and helping us to understand, the common background to these controversies.

In fact, Professor Harrison has already offered a replacement reading of these matters.[101] Indeed, it seems fair to say that he has developed his rejection of the voluntarism and science thesis in the light of his own alternative historiographical claim. If I am to complete my defence of the role of voluntarism in the development of early modern science, therefore, I must finally take notice of Professor Harrison's proposed substitute schema.

Postlapsarian Expectations and Voluntarist Theology

In his most recent book, *The Fall of man and the foundations of science*, Peter Harrison has offered a new and highly provocative account of the theological background to the development of the experimental method in the early modern

period.[102] Harrison suggests that the revival of the Augustinian view of original sin in the Reformation period provides an explanation of the development of the experimental method which is "far more plausible" than that offered by the voluntarism and science thesis. According to the Augustinian view postlapsarian humanity was simply incapable of knowing all that Adam had known before the Fall. When John Donne lamented in his *Anatomie of the world* of 1611 that "All is lost", his specific illustrations of that fact included the position of the Earth in the world system, the number of the elements, and knowledge of the correspondences of things in the chain of being, but what was also lost according to Augustinian theology was the intellectual capability of determining these matters.[103] Accordingly, Harrison wrote, for early modern thinkers,

> Experimental natural philosophy was a means of imposing discipline on both an errant world and on fallen human minds. The insistence on the particular virtues on the part of the natural philosopher, the use of artificial instruments, the manipulation of nature out of its normal course, the modest goals of probabilistic knowledge, all represent a response to the corruption of nature and the inherent infirmity of human minds.[104]

The first thing to say, here, is that I do not deny the validity of Harrison's claims about the role of thinking about original sin in the origins of the experimental method. On the contrary, I find them highly suggestive, extremely persuasive, and genuinely enlightening. It is certainly significant, as Harrison points out, that "the appearance of more pessimistic views about human cognitive powers were historically prior to the development of the empirical methods of the early modern natural philosophers", and

what's more, they were only just prior. A reading of Harrison's *Fall of man* should certainly leave the reader in no doubt that

> The birth of modern experimental science was not attended with a new awareness of the powers and capacities of human reason, but rather the opposite – a consciousness of the manifold deficiencies of the intellect, of the misery of the human condition, and of the limited scope of scientific achievement.[105]

And that, accordingly, "ideas of the Fall played a major role in both the origins of modern empiricism and in subsequent attempts to legitimate experimentalism."[106] It seems to me that it is only a matter of time before Harrison's thesis is recognised as making an indispensable contribution to our understanding of the development of early modern science.

It is beyond question, therefore, that Harrison's account of the role of theological ideas about the Fall in the origins of modern science should take its place alongside other accounts of the various different factors involved in the emphasis upon empiricism and the development of the experimental method. It is important to note, however, that the suggestion is not that Harrison's thesis should replace all other accounts, but that it should take its place alongside them. As we all know, history seldom, if ever, proceeds in accordance with single, isolated causes. It would be very odd, therefore, if Professor Harrison were to suggest that his new account should lead to the abandonment of, say, the scholar-and-craftsman thesis.[107] In spite of the undoubted richness and power of Harrison's new thesis, it still strikes me as odd to call for an abandonment of the voluntarism and science thesis.

Presumably Harrison would want to draw a distinction between the scholar and

craftsman thesis and the voluntarism and science thesis in so far as the former has

little or nothing in common with his own thesis, and so should be acknowledged as

addressing a set of genuinely alternative causal factors, whereas the voluntarism and

science thesis can be reduced to an aspect of the Harrison thesis. In other words,

Harrison would want to say that, in so far as the voluntarism and science thesis has

any merit, it derives from the fact that it is merely a partially understood rendering of

concerns about the postlapsarian incapacity of human intellects:

> It is not so much that God could have ordered nature in any way he chose
>
> which is significant for the development of an experimental approach to
>
> nature, but rather the fact that the Fall separated human beings from God and
>
> corrupted their minds. Nature itself had fallen, moreover, deviating from the
>
> original divine plan and becoming less intelligible.[108]

I believe Harrison's attitude here is coloured by what I have suggested throughout this

paper is a tendency to misread the voluntarism and science thesis (although, as I have

freely admitted, these misreadings often seem to derive from misrepresentations of the

thesis by its own proponents!). Even at the point in his discussion which I have just

quoted, there is a strong suggestion of this. In *The Fall of man* Harrison concludes his

brief dismissal of the relevance of voluntarist theology like this: "If the manner of

God's direction of the operations of nature is inscrutable to human minds, this is on

account of the limitations of the latter, rather than the irrationality of the former."[109]

Any claim that Christian thinkers believed in the irrationality of God deserves to be

treated with nothing but contempt, and Harrison would be right to reject the

voluntarism and science thesis *tout court* and *tout de suite* if that was properly a part of its claims. But the irrationality of God never was an aspect of voluntarist theology. To reject the claim that God's operation in creation can be reconstructed by human reason is not the same as saying that God operated irrationally. To be sure, Harrison could respond at this point that the inability of human reason to "think God's thoughts after him" is an aspect of Augustinian views about the postlapsarian state of humankind. I shall return to this point in a moment, but for now suffice it to say that I do not deny this, but it is a deflection away from the point I am trying to make. I merely want to say that it is wrong to dismiss the voluntarism and science thesis on the grounds that it requires God to be irrational, because it never did entail this requirement. It is my hope that I have said enough in the foregoing to undermine each and every one of Professor Harrison's strictures against the voluntarism and science thesis, and to show, therefore, that it can stand as a least equal in historiographical merit alongside the Harrison thesis, and alongside the scholar and craftsman thesis, claims about the rise in status of mathematics, or the revival of magic, and other factors which have been seen as contributory to the experimental method.[110]

But let us return to the claim, implicit if not explicit in Professor Harrison's recent book, that the voluntarism and science thesis does not merit separate consideration alongside his own thesis, because what some historians have discerned as voluntarist theology is in its essentials merely a partial understanding of the Augustinian theology of original sin. So that, to return to our recent example, the supposedly voluntarist claim that it is impossible to reconstruct God's thinking as he decided how to create the world, should not be seen as a claim that God could have done as he pleased without any rationally dictated constraints upon his freedom of action, but rather as a

claim that human minds are simply incapable (after the Fall) of being able to think as

God can think.

There are two things to say about this. The first thing to say is that, essentially, I

agree. Theology, like any system of thought, is a continuous network of ideas and

beliefs, and just as a modern geneticist would not, and could not, simultaneously

uphold his own beliefs about the operation of DNA in organic cells while rejecting the

claims about the chemical interactions of substances implicit in the periodic table of

the elements, so an early modern theologian would not compartmentalize his thought

in such a way that he could separate his ideas on original sin from his thinking about

the nature of God's providence.[111] I am perfectly willing to concede, therefore, that

Harrison's thesis throws much new light on the earlier work of historians who have

discerned a distinction between voluntarist theology and intellectualist theology.

Indeed, I not only concede it, I welcome it as a genuine enhancement of our historical

understanding. Thanks to Professor Harrison's work, we can now see that many of the

differences between voluntarists and intellectualists can be understood in terms of

those who took an Augustinian line, and were pessimistic about humanity's ability to

understand God and his creation, and those who rejected the Augustinian emphasis

upon the debilitating nature of original sin. Nevertheless, I think it would be a mistake

to abandon the voluntarism and science thesis.

This brings me to my second point. In spite of the undoubted affiliations, or

connections, between Harrison's thesis and the voluntarism and science thesis, I

believe it would be a serious mistake to abandon the latter and henceforth to discuss

the historical scene solely in the terms proposed by Professor Harrison. I believe there

is a reason why the voluntarism and science thesis was first proposed in the 1930s while the postlapsarian dimension to the origins of the experimental method had to await the appearance of a historian with the thoroughness and erudition of Peter Harrison. Putting it simply, the relevance of attitudes to God's providence in the origins of modern science, is easier to spot, especially for scholars raised in our secular age, than the relevance of notions of original sin. The very fact that theological conceptions of what God can and cannot do in the creation of the world were recognised as pertinent factors early in the history of the discipline of history of science (and were provided with the convenient labels of 'voluntarist' and 'intellectualist' theology), is surely sufficient indication that these terms are useful in helping us to fully understand the development of early modern science.

We do not have to confine ourselves here to vague rhetorical gesturing in favour of an old tradition in the historiography of science. There is a good reason to uphold the claim that the voluntarism and science thesis should stand shoulder to shoulder alongside Harrison's thesis rather than be subsumed into it. I have repeatedly mentioned throughout this paper the relevance of background fears among the devout of the rise of atheism, and the need to counter it. Certainly, this was an important element in each of the controversies we looked at earlier.

Our concern as historians of science is not with what was going on in mainstream theology at the time of the Scientific Revolution, but how issues in theology were taken up by natural philosophers or others whose primary concern was an understanding of nature. Accordingly, it is easy to see that the prime consideration of the "secular theologians" who Amos Funkenstein saw as emerging from the ranks of

the natural philosophers were chiefly concerned to prove the existence of God.[112] As they tried to work out the details of their strategies for combating atheism, some chose to rely on what they saw as ineluctable reason to demonstrate his existence, while others preferred to focus directly on the details of the natural world and insist that they entailed an omnipotent creator. In view of what we said above about the connections between different aspects of systems of thought, there can be little doubt that the choices made here as to the best way to combat atheism could be mapped onto the theological concerns upon which Peter Harrison has concentrated. Presumably, those who chose to demonstrate God's existence by dint of rational argument were ill-disposed towards Augustinian pessimism about the inadequacies of the fallen human intellect.

But, more to the point for our purposes, it was also during the development of these strategies for proving the existence of God, that the natural philosophers found themselves having to defend their theological views against the opposing camp, and also, more often than not, their concomitant natural philosophical views (defending mechanistic explanations against those involving a hylarchic principle, say, or defending an instrumentalist concept of gravity against a mechanistic concept of gravity).[113] It was in such an arena, therefore, that the theologies which historians have dubbed voluntarist and intellectualist were developed. In developing these differing theologies our secular theologians drew upon earlier traditions in Christian theology, some deriving from the early Middle Ages, but they never allowed themselves to lose sight of the fact that they were addressing putative atheists.

It is the consciousness of the audience which was being addressed that led to the distinctiveness of these secular theologies, marking them as distinct from (although affiliated to) differing views on original sin. Clearly, if you wish to convince an atheist that he should believe in God it is futile to try to engage him in discussion of the niceties of St Augustine's views on original sin and the implications of that view for our epistemologies, much less for the best means to our salvation. The concerns that Harrison so superbly delineates in his *Fall of Man* were crucially important among the devout, and within theological, or simply confessional, debate, but the secular theologies discerned by Foster, Lovejoy, and the subsequent commentators on voluntarist or intellectualist theologies were either aimed directly at the less devout, or were developed by lay thinkers at least conscious of the need for a theology intended ultimately for the ungodly. The result was a distinctive set of approaches to a limited range of religious issues, which deserve, *pace* Harrison, continued separate consideration by historians seeking to understand the development of early modern science and its relationship to religion. If we were to abandon the voluntarism and science thesis, and to reduce all the issues previously seen as aspects of voluntarist or intellectualist theologies to aspects of Augustinian or Thomist attitudes to original sin, I believe we would be in danger of obliterating various important nuances. The clearest example of this would be the anti-atheist intentions of early modern natural philosophers, which could hardly be brought out if their discussions were reduced to a concern with the effects of original sin.

Perhaps there is a simpler way to characterise the difference between the theological issues with which Harrison is concerned, and those which I have been trying to defend here. The theology which Professor Harrison focuses upon was chiefly concerned

with the nature of *man* and his abilities, in particular the power of his intellect; the theology I am defending was concerned with the nature of *God* and his abilities, in particular the extent of his omnipotence. Although I accept that these two sets of concerns are not as separate as this stark characterisation of them might suggest, I nonetheless feel that they are sufficiently distinct on a number of levels that it would be a serious mistake to abandon the voluntarism and science thesis.

Well, I have gone on too long, but I hope I have said enough to show that, Professor Harrison's strictures notwithstanding, if we wish to understand the wider context of the early modern controversies we have considered here, we need to be aware of the separate traditions of voluntarist and intellectualist theology, and the respective preoccupations and presuppositions of their subscribers. I hope I have said enough, but I am all too aware that I might be in the position of poor Samuel Clarke when he tried in person to persuade Princess Caroline to abandon Leibniz's philosophical theology and to adopt instead the Newtonian view. As Caroline subsequently wrote to Leibniz:

> He talked to me a very long time in an effort to convert me to his opinion and wasted his breath.[114]

and Professor Robert Segal. I am also extremely grateful for the invaluable help and advice of fellow subscribers to the voluntarism and science thesis who took the trouble to read this in draft: Professors Margaret Osler, James E. Force, and Edward B. Davis. Above all, however, I owe thanks to Professor Peter Harrison, who spotted my announcement of an intention to refute his claims in a footnote to a piece I published in 2004, and made contact with me then, and who was also a participant at the workshop in Aberdeen. Peter has been unfailingly helpful and encouraging, and has always responded to my criticisms with the same spirit in which they are offered: as attempts to improve our historical understanding.

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[1] Michael Foster, "The Christian doctrine of Creation and the rise of modern natural science", *Mind*, new series xliii (1934), 446-68; idem, "Christian theology and modern science of nature (I)", *Mind*, n. s. xliv (1935), 439-66; idem, "Christian theology and modern science of nature (II)", *Mind*, n. s. xlv (1936), 1-27; and Arthur O. Lovejoy, *The Great Chain of Being: A study of the history of an idea* (Cambridge, Mass., 1936). For a fascinating study of the life and work of Michael Foster, perhaps the initiator of what Harrison calls the "voluntarism and science thesis", see Cameron Wybrow (ed.), *Creation, nature and political order in the philosophy of Michael Foster (1903-1959). The classic* Mind *articles and others, with modern critical essays* (Lewiston, Queenston, and Lampeter, 1992). See also Edward B. Davis, "Christianity and early modern science: The Foster thesis reconsidered", in David N. Livingstone, D. G. Hart, and Mark A. Noll (eds), *Evangelicals in historical perspective* (Oxford, 1999), 75-95.

[2] Robert K. Merton, *Science, technology and society in seventeenth-century England* (New York, 1970). On the influence of this, see, for example, I. B. Cohen (ed.),

Puritanism and the rise of modern science: The Merton thesis (New Brunswick, 1990).

3 Peter Harrison, "Voluntarism and early modern science", *History of science*, xl (2002), 63-89.

4 See Francis Oakley, *Omnipotence, covenant and order: An excursion in the history of ideas from Abelard to Leibniz* (Ithaca, 1984). Abelard is discussed also in Lovejoy, *Great Chain of Being*. For an indication that this debate is still current in contemporary theology, consider William L. Rowe, *Can God be free?* (Oxford: Clarendon Press, 2004).

5 Aristotelianism was recovered by Latin thinkers, chiefly from the civilisation of Islam, in the so-called Twelfth-Century Renaissance, and many were smitten with what at that time was its incomparable intellectual beauty and power. See Charles Homer Haskins, *The renaissance of the twelfth century* (Cambridge, Mass., 1927); Tina Stiefel, *The intellectual revolution in twelfth-century Europe* (London, 1985); Richard E. Rubinstein, *Aristotle's children* (Orlando, 2003).

6 For a list of the propositions and commentary, see Edward Grant (ed.), *A source book in medieval science* (Cambridge, Mass., 1974).

7 See Oakley, *Omnipotence, covenant and order* (ref. 4). This same concern with whether a particular claim could be regarded as logically impossible, even for God, or merely physically impossible and therefore capable of being accomplished by God's omnipotence, can be seen in the late seventeenth century, in the dispute between John Locke and Edward Stillingfleet. This is discussed below in the section headed: "Intellectualist versus Voluntarist Controversies".

8 Siger of Brabant and Boethius of Dacia were the most notorious of those who saw Aristotelian philosophy as taking precedence over Christian theology. See Pierre

Mandonnet, *Siger de Brabant et l'averroïsme latin au XIIIe siècle* (Freiburg, 1899) ;

Rubinstein, *Aristotle's children* (ref. 5); Edward Grant, *The foundations of modern

science in the Middle Ages: Their religious, institutional, and intellectual contexts*

(Cambridge, 1996); David C. Lindberg, *The beginnings of Western science: The

European scientific tradition in philosophical, religious, and institutional context, 600

B.C. to A.D. 1450* (Chicago, 1992).

[9] At least according to Anthony Levi, *Renaissance and Reformation, the intellectual

genesis* (New Haven, 2002), 58. Levi does not provide a source but for a compatible

view of William of Ockham's philosophy see Marcia L. Colish, *Medieval foundations

of the Western intellectual tradition* (New Haven, 2002), 314. But see A. S. McGrade,

"Natural law and moral omnipotence", in Paul Vincent Spade (ed.), *The Cambridge

companion to Ockham* (Cambridge, 1999), 273-301. A quick glance at recent sources

on William of Ockham seems to suggest that there is little consensus about his

philosophical aims and intentions.

[10] Amos Funkenstein, *Theology and the scientific imagination: From the Middle Ages

to the seventeenth century* (Princeton, 1986), 3.

[11] David C. Lindberg, *The beginnings of Western science* (Chicago, 1992), 223-34.

[12] On this, see John Henry, "England", in Roy Porter and Mikuláš Teich (eds), *The

Scientific Revolution in national context* (Cambridge, 1992), 178-210.

[13] Thomas Hobbes, for example, equated what he called 'Aristotelity' with

Romanism. See Thomas Hobbes, *Leviathan* (London, 1655), Pt IV, Ch. 46, 370. Even

a devout Roman Catholic innovator like Descartes was all too aware that his departure

from Aristotelianism might be seen as a betrayal of Roman Catholic values. See Gary

Hatfield, "Reason, nature, and God in Descartes", *Science in context*, iii (1989), 175-

201. See also Henry, "England" (ref. 9).

[14] The association of the new philosophies with atheism was largely due to the standard association of atomism with Epicurus, and Epicureanism with materialist and hedonistic atheism; this was exacerbated, of course, by similar associations with Hobbes and Hobbism. See T. F. Mayo, *Epicurus in England (1650-1725)* (Dallas, 1934); G. D. Hadzsits, *Lucretius and his influence* (London, 1935); S. I. Mintz, *The hunting of Leviathan: Seventeenth-century reactions to the materialism and moral philosophy of Thomas Hobbes* (Cambridge, 1970). On atheism more generally, and its links to natural philosophy, in this period, see Michael J. Buckley, *At the origins of modern atheism* (New Haven, 1987).

[15] The possible exception is Thomas Hobbes, widely regarded by his contemporaries as an atheist. See Mintz, *The hunting of Leviathan* (ref. 11). But Hobbes's own religious devotion is now being proposed by a number of scholars. See, for example, A. P. Martinich, *The two gods of Leviathan: Thomas Hobbes on religion and politics* (Cambridge, 1992); Jeffery R. Collins, *The allegiance of Thomas Hobbes* (Oxford, 2005); and George Wright, *Religion, politics and Thomas Hobbes* (Dordrecht, 2006).

[16] Jonathan Israel, *The radical Enlightenment* (Oxford, 2001), 159.

[17] On Spinoza's concept of God see, for example, Alan Donagan, "Spinoza's Theology", in Don Garrett (ed.), *The Cambridge companion to Spinoza* (Cambridge, 1996), 343-82. It is clear, to cite one example, that Spinoza's philosophical theology is a major target of Samuel Clarke's in his Boyle Lectures, published as *A demonstration of the being and attributes of God: More particularly in answer to Mr. Hobbs, Spinoza, and their followers. ... Being the substance of eight sermons preach'd at the cathedral-church of St. Paul, in the year 1704* (London, 1705). I am grateful to James Force for pointing this out to me.

[18] Boyle was already concerned with voluntarist theology, for example, when he wrote his "An essay containing a requisite digression, concerning those that would exclude the Deity from intermeddling with matter", in about 1660, and which he published in 1663. See *The works of Robert Boyle*, edited by Michael Hunter and Edward B. Davis, 14 vols (London, 1999), iii, 245. This is also available in M. A. Stewart (ed.), *Selected Philosophical Papers of Robert Boyle* (Indianapolis, 1991), 155-75. I am grateful to Edward B. Davis for providing me with this example. Similarly, Henry More was already concerned to oppose voluntarist theology, which he seems to have regarded as a Calvinist error (see ref. 69 below), in the early 1660s. On Descartes and voluntarism/intellectualism, see Funkenstein, *Theology and the scientific imagination* (ref. 7); Margaret J. Osler, *Divine will and the mechancial philosophy: Gassendi and Descartes on contingency and necessity in the created world* (Cambridge, 1994); and Hatfield, "Reason, nature, and God in Descartes" (ref. 10). The protestant reformers, especially Calvin, have usually been regarded by modern commentators as revivers of voluntarist theology. Harrison shows that this is not as clear cut as the historiography would have us believe, and I accept his arguments.

[19] It might be argued that the threat of atheism cannot have been a factor because real evidence of atheism, or atheists, in the early modern period is so hard to find. This may be true, but what is beyond doubt is that devout thinkers saw contemporary atheists as an immediate threat to religion and society. My argument does not depend on the actual extent of atheism in the period, therefore, but on the fact that it was perceived by the devout to be frighteningly widespread. On this issue, see R. S. Westfall, *Science and religion in seventeenth-century England* (Ann Arbor, 1973); Alan Charles Kors, *Atheism in France, 1650-1729. Vol. 1: The orthodox sources of*

disbelief (Princeton, 1990); Michael Hunter and David Wooton (eds), *Atheism from the Reformation to the Enlightenment* (Oxford, 1992); Michael Hunter, "Science and heterodoxy: An early modern problem reconsidered", in D. C. Lindberg and R. S. Westman (eds), *Reappraisals of the Scientific Revolution* (Cambridge, 1990), 437-60.

[20] Peter Harrison, "Voluntarism and early modern science". For earlier discussions of voluntarist theology in the history of early modern science consider, Foster, "The Christian doctrine of Creation and the rise of modern natural science" (ref. 1); Francis Oakley, "Christian theology and the Newtonian science: The rise of the concept of the laws of nature", *Church history*, xxx (1961), 433-57; idem, *Omnipotence, covenant, and order* (ref. 4); J. E. McGuire, "Boyle's conception of nature", *Journal of the history of ideas*, xxxiii (1972), 523-42; Eugene Klaaren, *Religious origins of modern science* (Grand Rapids, 1977); Funkenstein, *Theology and the scientific imagination* (ref. 7); and Osler, *Divine will and the mechanical philosophy* (ref. 15).

[21] John Henry, "Medicine and pneumatology: Henry More, Richard Baxter and Francis Glisson's *Treatise on the energetic nature of substance*", *Medical history*, xxxi (1987), 15-40; and "Henry More versus Robert Boyle: The spirit of nature and the nature of Providence", in Sarah Hutton (ed.), *Henry More (1614-1687): Tercentenary studies* (Dordrecht, 1990), 55-75. See also, John Henry, "The matter of souls: Medical theory and theology in seventeenth-century England", in R.K. French and A. Wear (eds), *The medical revolution in the seventeenth century* (Cambridge, 1989), 87-113; and "Henry More and Newton's gravity", *History of science*, xxxi (1993), 83-97. On the dispute between Stillingfleet and Locke see John W. Yolton, *Thinking matter: Materialism in eighteenth-century philosophy* (Oxford, 1984).

[22] H. G. Alexander, *The Leibniz-Clarke correspondence* (Manchester, 1956); Alexndre Koyré and I. B. Cohen, "Newton and the Leibniz-Clarke correspondence",

Archives internationales d'histoire des sciences, xv (1962), 63-126; F. E. L. Priestley,

"The Clarke-Leibniz controversy", in R. Butts and J. W. Davis (eds), *The*

methodological heritage of Newton (Oxford, 1970), 34-56; and Carolyn Iltis, "The

Leibnizian-Newtonian debates: Natural philosophy and social psychology", *British*

journal for the history of science, vi (1973), 343-77.

[23] Harrison, "Voluntarism and early modern science", 64.

[24] Harrison, "Voluntarism and early modern science", 64.

[25] Harrison, "Voluntarism and early modern science", 66.

[26] Harrison, "Voluntarism and early modern science", 66, on his rejection of Osler's

position, see 65-6. See also, Osler, *Divine will and the mechanical philosophy* (ref.

15). Descartes has also been seen as an intellectualist in his theology, rather than a

voluntarist, by Edward B. Davis. See his, "Creation, contingency and early modern

science: The impact of voluntaristic theology on seventeenth-century natural

philosophy" (Ph.D. thesis, Indiana University, 1984), Chapter 3, 67-121; and "God,

man and nature: The problem of creation in Cartesian thought", *Scottish journal of*

theology, xliv (1991), 325-48; and "Christianity and early modern science" (ref. 1),

83-5.

[27] Gary Hatfield, *Descartes and the Meditations* (New York and London, 2003), 16-7,

and 300-01. For a fuller exposition see Hatfield, "Reason, nature, and God in

Descartes" (ref. 10).

[28] Funkenstein, *Theology and the scientific imagination* (ref. 7); Osler, *Divine will and*

the mechanical philosophy (ref. 15). Osler argues that Descartes is, in the practice of

his philosophy, an intellectualist rather than a voluntarist, because he relies on the

immutability of God to develop his philosophy rationalistically, not empirically. This

is controversial but it is compatible with Hatfield's view, see Hatfield, "Reason,

nature, and God in Descartes" (ref. 10). See also the works by Edward B. Davis cited in ref. 23 above.

[29] Hatfield, "Reason, nature, and God in Descartes" (ref. 10).

[30] Hatfield, "Reason, nature, and God in Descartes" (ref. 10), especially pp. 194-97

[31] Hatfield, "Reason, nature, and God in Descartes" (ref. 10), but see also, for a simpler account, Hatfield, *Descartes and the Meditations* (ref. 24), 300-01.

[32] P. M. Heimann, "Voluntarism and immanence: Conceptions of nature in eighteenth-century thought", *Journal of the history of ideas*, xxxix (1978), 271-83.

[33] Harrison, "Voluntarism and modern science", 69.

[34] On occasionalism, see, for example, Daniel Garber, "Descartes and occasionalism", and Steven Nadler, "The occasionalism of Louis de la Forge", both in Stephen Nadler (ed.), *Causation in early modern philosophy* (University Park, 1993), 9-26, and 57-73 respectively; and Stephen Nadler, "Descartes and occasional causation", *British journal for the history of philosophy*, ii (1994), 35–54.

[35] Henry More denied that God could make matter active, except by infusing it with an active immaterial substance. See Henry More, *Divine dialogues, containing sundry disquisitions and instructions concerning the attributes and Providence of God in the world…* 2 vols (London, 1668). Edward Stillingfleet objected to Locke's suggestion that nothing prevented an omnipotent God from creating matter capable of thinking. See below, and Edward Stillingfleet, *The Bishop of Worcester's answer to Mr Locke's letter* (London: 1697), and *The Bishop of Worcester's answer to Mr Locke's second letter* (London, 1698).

[36] This is evident, for example, in Baxter's response to Henry More's claims that God cannot make matter active in its own right. See, below and Henry, "Medicine and pneumatology" (ref. 18).

[37] See Harrison, "Voluntarism and early modern science", 70-76. For an insight into the background of his thinking on early modern debates about miracles see Peter Harrison, "Newtonian science, miracles, and the laws of nature", *Journal of the history of ideas*, lvi (1995), 531-53. We will come back to miracles, and the distinction between God's ordained and absolute power, below.

[38] Harrison, "Voluntarism and early modern science", 76.

[39] Isaac Newton, MS Yahuda 21, fol. 2r, quoted from Harrison, "Voluntarism and early modern science", 68. Available on-line thanks to the Newton Project (http://www.newtonproject.sussex.ac.uk/), where it is described as a "Draft sermon on 2 Kings, 17, 15-16; and Isaac Newton, "Of Natures obvious laws & processes in vegetation", Dibner Collection MS. 1031B, f. 4v (available on-line at "The chymistry of Isaac Newton" website: http://webapp1.dlib.indiana.edu/newton/mss/norm/ALCH00081).

[40] Harrison, "Voluntarism and early modern science", 76.

[41] Harrison, "Voluntarism and early modern science", 76-7.

[42] See, for example, Edward B. Davis, "Newton's rejection of the 'Newtonian world view': The role of divine will in Newton's natural philosophy", in Jitse M. van der Meer (ed.), *Facets of faith and science. Volume 3: The role of beliefs in the natural sciences* (Lanham, MD, 1996), 75-96.

[43] Harrison, "Voluntarism and early modern science", 76-7.

[44] Peter Harrison, "Was Newton a voluntarist?" in J. E. Force and Sarah Hutton (eds), *Newton and Newtonianism* (Dordrecht, 2004), 39-63, p. 42. Also quoted, from "the laws of nature" onwards, in Harrison, "Voluntarism and early modern science", 76-7. Isaac Newton, "Of the Church", MS Bodmer, Ch. 1, 4r-5r. In both places Harrison invites us to compare this quotation with one from Newton's *Irenicum or ecclesiatical*

polyty tending to peace, Keynes MS 3, fol. 5. Although this passage does repeat the suggestion that these two commandments are fundamental, there is no corresponding suggestion that they are based on eternal and immutable reason. So it seems that Newton was not so concerned with the latter issue.

[45] Harrison, "Voluntarism and early modern science", 77.

[46] On Descartes, see Hatfield, "Reason, nature, and God in Descartes" (ref. 10); on Leibniz, see Lovejoy, *Great Chain of Being* (ref. 1). In Kepler's case it seems to be impossible to provide a precise reference to the phrase, "thinking God's thoughts after him", even though this is habitually attributed to him. For our purposes, however, the fact of this common attribution can be seen as a convenient summing-up of the way Kepler did think about God. If this won't do, then consider his claim that "Geometry, which before the origin of things was coeternal with the divine mind and is God himself (for what could there be in God which would not be God himself?), supplied God with patterns for the creation of the world, and passed over to Man along with the image of God." See Johannes Kepler, *The harmony of the world*, translated by E. J. Aiton, A. M. Duncan, and J. V. Field (Philadelphia, 1997), Book IV, Ch. 1, 304. The implication of this seems to be that God did not freely create the rules of geometry, but that they were co-eternal with him, and guided his hand (and mind) in creating the world.

[47] Harrison, "Voluntarism and early modern science", 78.

[48] Harrison, "Was Newton a voluntarist?"

[49] The Leibniz-Clarke correspondence is briefly mentioned in Harrison, "Was Newton a voluntarist?" on pages 43, 46-7, and 59.

[50] Harrison, "Was Newton a voluntarist?" 41. The four claims are these: The divine will has primacy over the divine intellect, and is unconstrained by considerations of

goodness and wisdom; the divine will is arbitrary; the universe is directly dependent on the will of God; God's activity in the world is not restricted by the laws he has ordained… for he can miraculously intervene in nature at will. It is the second and third of these which Harrison regards as general, not specifically voluntarist, beliefs. I agree with regard to the third, but not the second.

[51] Harrison, "Was Newton a voluntarist?" 43. Harrison is quoting from Gregory MS 245, fol. 14a. For the discussion of the crucial quotation from "Of the Church", see in the text above at note 39 and following.

[52] See text above at ref. 42; and Harrison, "Voluntarism and early modern science", 77.

[53] Harrison, "Was Newton a voluntarist?" 43. On the distinction between God's *potentia absoluta* and *potentia ordinata*, see William Courtenay, *Capacity and volition: A history of the distinction of absolute and ordained power* (Bergamo, 1990); and Lawrence Moonan, *Divine power: The medieval power distinction up to its adoption by Albert, Bonaventure, and Aquinas* (Oxford, 1994).

[54] Harrison, "Was Newton a voluntarist?" 59.

[55] Daniel 3, 13-27.

[56] I have simply made up this example of the efficacious sweat; there may be other possible naturalistic explanations. Although most onlookers would presumably have thought, as Nebuchadnezzar evidently did, that the phenomenon had something to do with the fourth person who appeared in the flames alongside the three youths. For a discussion of this episode in historical debates, see Oakley, *Omnipotence, covenant, and order* (ref. 4), 67-92.

[57] William Whiston, *A new theory of the Earth, from its original to the consummation of all things* (London, 1696). See James E. Force, *William Whiston, honest Newtonian*

(Cambridge, 1985). On the role of comets more generally in Newton's cosmology see David Kubrin, "Newton and the cyclical cosmos", *Journal of the history of ideas*, xxix (1967), 325-46; and Simon Schaffer, "Newton's comets and the transformation of astrology", in Patrick Curry (ed.), *Astrology, science, and society: Historical essays* (Woodbridge, Suffolk, 1987), 219-43. See also Sara J. Schechner, *Comets, popular culture, and the birth of modern cosmology* (Princeton, 1997). For further examples of naturalistic explanations of comets by Newton and his followers, see Harrison, "Newtonian science, miracles, and the laws of nature" (ref. 34).

[58] Harrison, "Newtonian science, miracles, and the laws of nature" (ref. 34).

[59] I shall come back to this shortly.

[60] Harrison, "Was Newton a voluntarist?" 43, citing as his source Gregory MS 245, fol. 14a.

[61] Isaac Newton, *Opticks*, Book III, Part 1, Query 31 (New York, 1952), 403. For an excellent indication of the complexity of Newton's views on miracles see James E. Force, "Providence and Newton's *Pantokrator*: Natural law, miracles, and Newtonian science", in Force and Hutton (eds), *Newton and Newtonianism* (ref. 41), 65-92. Harrison's "Newtonian science, miracles, and the laws of nature" (ref. 34) offers an interpretation of Newton's view of miracles which is more philosophically coherent. This might be correct, but I do wonder whether Newton was quite as careful in his thinking about miracles as Harrison suggests. My own feeling, that Newton might have happily assumed God saved Shadrach, Meshach, and Abednego simply by willing it, is supported by his speculations in Query 31 in Book IV of the *Opticks* that we are all, as it were, phantasms in the mind (or "sensorium") of God, and that just as we can, in our imaginations, fantasize about people doing what we want them to do, so God can make us, in reality, do what he wants us to do.

[62] I speak of physical miracles. Leibniz did allow miracles but insisted that "when God works miracles, he does not do it in order to supply the wants of nature, but those of grace." See "Mr Leibniz's First Paper", (November, 1715), Alexander (ed.), *Leibniz-Clarke correspondence*, 12. On miracles in Leibniz's philosophy, see Gregory Brown, "Miracles in the best of all possible worlds: Leibniz's dilemma and Leibniz's razor", *History of philosophy quarterly*, xii (1995), 19-39.

[63] This is made clear in Force, "Providence and Newton's *Pantokrator*" (ref. 58), especially pp. 66-7.

[64] Consider Westfall, *Science and religion in seventeenth-century England* (ref. 16), 204; Harrison, "Newtonian science, miracles, and the laws of nature" (ref. 34), 537; and Force, "Providence and Newton's *Pantokrator*" (ref. 58).

[65] Natural philosophers, after all, were not theologians, and would have seen it as a betrayal of their natural philosophical principles to invoke God's direct intervention in their explanations. In this regard, the recent claims of Andrew Cunningham which elide natural philosophy with theology are highly misleading, and I support the counter-claims of Edward Grant, Peter Dear and Peter Harrison. See, Andrew Cunningham, "Getting the game right: Some plain words on the identity and invention of science", *Studies in the history and philosophy of science*, xix (1988), 365-89; Edward Grant, "God, science, and natural philosophy in the late Middle Ages," in Lodi Nauta and Arjo Vanderjagt (eds), *Between demonstration and imagination: Essays in the history of science and philosophy presented to John D. North* (Leiden, 1999), 243-67; Peter Dear, "Religion, science and natural philosophy: Thoughts on Cunningham's thesis", *Studies in history and philosophy of science*, xxxii (2001), 377-86; and Peter Harrison, "Physico-theology and the mixed sciences: The role of theology in early modern natural philosophy", in Peter R. Anstey and John A.

Schuster (eds), *The science of nature in the seventeenth century* (Dordrecht, 2005), 165-83. Although Newton was happy to leave various aspects of the natural world unexplained, so that he could invoke a 'God of the gaps', he did not believe that these aspects of the world system could *never* be explained by secondary causes, merely that they could not be explained, *pace* Descartes, at present.

[66] Admittedly, not all representatives of intellectualist theology at this time were powerful philosophical thinkers. Consider, for example, the Cambridge Platonists, Henry More and Ralph Cudworth, whose views have never really been taken seriously in the philosophical canon.

[67] The medieval background is most clearly seen in Etienne Tempier's condemnation and proscription of various Aristotelian propositions being taught at the University of Paris in 1277. On this, see Reijer Hooykaas, "Science and Theology in the Middle Ages", *Free University Quarterly*, iii (1954), 77-163; and Edward Grant, "The condemnation of 1277, God's absolute power, and physical thought in the late Middle Ages", *Viator*, x (1979), 211-44. For a more general consideration of these theological concerns in the Middle Ages, see William J. Courtenay, *Covenant and causality in medieval thought: Studies in philosophy, theology and economic practice* (Aldershot, 1984).

[68] On Henry More's views see Alexandre Koyré, *From the closed world to the infinite universe* (Baltimore, 1957); On Leibniz's views, see, for example, Alexander (ed.), *The Leibniz-Clarke correspondence*, especially pp. 43-5; and Ezio Vailati, *Leibniz and Clarke: A study of their correspondence* (Oxford, 1997), Ch. 4, 109-37.

[69] See ref. 16 above.

[70] For details, see Henry, "Henry More versus Robert Boyle" (ref. 18).

[71] Alan Gabbey, "*Philosophia Cartesiana Triumphata*: Henry More (1646–1671)", in J. W. Davis, J. M. Nicholas, and T. M. Lennon (eds), *Problems of Cartesianism* (Toronto, 1982), 171–250; and idem, "Henry More and the limits of mechanism", in Hutton (ed.), *Henry More (1614–1687)* (ref. 18), 19-36. See also Alison Coudert, "Henry More and witchcraft", in Hutton (ed.), *Henry More (1614–1687)* (ref. 18), 115-36.

[72] Richard Ward, *The Life of Henry More, Parts 1 and 2*, edited by Sarah Hutton, Cecil Courtney, Michelle Courtney, Robert Crocker and A. Rupert Hall (Dordrecht, 2000), 15-16.

[73] See J. Henry, s.v. "Henry More", in *The Stanford encyclopaedia of philosophy*, http://plato.stanford.edu/entries/henry-more/

[74] Henry More, *The immortality of the soul* (London, 1659). See Henry, "Henry More versus Robert Boyle" (ref. 18).

[75] The *Hydrostatical discourse* was first published in *Tracts written by the Honourable Robert Boyle* (London, 1672), see *The works of Robert Boyle*, ed. Hunter and Davis (ref. 15), vii, 184.

[76] Robert Boyle, *A free enquiry into the vulgarly receiv'd notion of nature* (London, 1686), in *Works*, ed. Hunter and Davis (ref. 15), x, 486.

[77] Henry More, *Annotations upon Lux orientalis*, 166. This is included, with separate pagination, in [Henry More], *Two Choice and Useful Treatises: the one Lux Orientalis; Or An Enquiry into the Opinions of the Eastern Sages Concerning the Praeexistence of Souls… [by Joseph Glanvill] The Other, A Discourse of Truth, By the late Reverend Dr. Rust… with Annotations on them both* (London, 1682). Boyle, *Works*, ed. Hunter and Davis (ref. 15), x, 566.

[78] Henry More, *Letter to a learned psychopyrist*, 198. This is included in More's posthumous edition of Joseph Glanvill's *Saducismus triumphatus: or, full and plain evidence concerning witches and apparitions. In two parts. The first treating their possibility; the second of their real existence* (London, 1682).

[79] Richard Baxter, *Of the immortality of mans soule, and the nature of it and other spirits. Two discourses: one in a letter to an unknown doubter; the other in reply to Dr Henry More's animadversions on a private letter to him…* (London 1682), 28-9.

[80] On this see, for example, Oakley, *Omnipotence, covenant and order* (ref. 4), Ch. 2, 41-65.

[81] Or Robert Hooke, who also published a refutation of More's spirit of nature. See Robert Hooke, *Lampas, or descriptions of some mechanical improvements of lamps & waterpoises* (London, 1677).

[82] Edward Stillingfleet, *The Bishop of Worcester's answer to Mr Locke's letter* (London: 1697), and *The Bishop of Worcester's answer to Mr Locke's second letter* (London, 1698). See also Yolton, *Thinking matter* (ref. 18). On Locke's proclivity to voluntarist theology and its attendant philosophy see, for example, John R. Milton, "John Locke and the nominalist tradition", and G. A. J. Rogers, "Locke, law and the laws of nature", both in Reinhard Brandt, *John Locke: Symposium Wolfenbüttel 1979* (Berlin: Walter de Gruyter, 1981), pp. 128-45, and 146-62, respectively; and G. A. J. Rogers, "Newton and the guaranteeing God", in James E. Force and Richard H. Popkin (eds), *Newton and religion: Context, nature, and influence* (Dordrecht, 1999), 221-35.

[83] John Locke, *Essay concerning human understanding…*, Bk IV, Ch. 3, para. 6.

[84] Ibid.

[85] Edward Stillingfleet, *Works*, 6 vols (London, 1710), iii, 513.

[86] John Locke, *Essay concerning human understanding…* Book 4, Ch. 3, para. 3, and Ch. 10, para. 16.

[87] There are numerous editions of Locke's response to Stillingfleet. I have used: John Locke, "Controversy with the Bishop of Worcester", in John Locke, *Locke's philosophical works*, 2 vols. (London, 1892), ii, 398.

[88] Ibid, p. 396. For the original story of Balaam's ass, see Numbers 22: 21-38.

[89] Newton's belief recorded by his friend John Craig, Cambridge University Library, Keynes MS 130.7, f. 1r. See also Isaac Newton, "De Gravitatione et aequipondio fluidorum", in A. R. Hall and M. B. Hall (eds), *Unpublished scientific papers of Isaac Newton* (Cambridge, 1962), 139.

[90] G. W. Leibniz, First Paper (November, 1715), Alexander (ed.), *Leibniz-Clarke correspondence*, 11. It is worth noting, also, that Leibniz's opening salvo also includes an attack on the voluntarist position of Locke that we have just been considering: "Mr. Locke and his followers, are uncertain at least, whether the soul be not material, and naturally perishable."

[91] Samuel Clarke, First Reply (November 1715), Alexander (ed.), *Leibniz-Clarke correspondence*, 14.

[92] Leibniz, Fourth Paper (June 1716), postscript, Alexander (ed.), *Leibniz-Clarke correspondence*, 44.

[93] "Mr Leibnitz's Second Paper", Alexander (ed.), *Leibniz-Clarke correspondence*, p. 16. On the principle of sufficient reason and its links to intellectualist theology see Lovejoy, *Great Chain of Being* (ref. 1), Ch. 5.

[94] Samuel Clarke, Second Reply (January 1716), Alexander (ed.), *Leibniz-Clarke correspondence*, 20, see also 21.

[95] Leibniz to Caroline, 11 September 1716; and Leibniz to Caroline, 2 June 1716, Alexander (ed.), *Leibniz-Clarke correspondence*, 197 and 195 respectively.

[96] Leibniz, Third Paper (February 1716), Alexander (ed.), *Leibniz-Clarke correspondence*, 27-8.

[97] Samuel Clarke, Third Reply (May 1716), Alexander (ed.), *Leibniz-Clarke correspondence*, 35.

[98] Leibniz, Fourth Paper (June 1716), Alexander (ed.), *Leibniz-Clarke correspondence*, 39.

[99] Samuel Clarke, Fourth Reply (June 1716), Alexander (ed.), *Leibniz-Clarke correspondence*, 50.

[100] Samuel Clarke, Fifth Reply (October 1716), Alexander (ed.), *Leibniz-Clarke correspondence*, 99-100. For a full account of the role of the principle of sufficient reason in Leibniz's philosophy, it is not necessary to look any further than Lovejoy, *Great Chain of Being* (ref. 1).

[101] I am grateful to Peter Harrison for bringing his alternative schema to my attention, first of all in his response to my paper at the University of Aberdeen, and subsequently in personal communications.

[102] Peter Harrison, *The Fall of man and the foundations of science* (Cambridge, 2007).

[103] John Donne, *An anatomie of the world: The first anniversary* (1611), ll. 206-9, and 491-96.

[104] Peter Harrison, "Original Sin and the problem of knowledge in early modern Europe", *Journal of the history of ideas*, lxiii (2002), 239-59, quotation pp. 258-9.

[105] Harrison, *The Fall of man* (ref. 99), 258.

[106] Harrison, "Original Sin and the problem of knowledge in early modern Europe" (ref. 101), 258.

[107] See Edgar Zilsel, *The social origins of modern science* (Dordrecht, 2000); and Pamela H. Smith, *The body of the artisan: Art and experience in the Scientific Revolution* (Chicago, 2004).

[108] Harrison, *The Fall of man* (ref. 99), 12. See also Harrison, "Original Sin and the problem of knowledge in early modern Europe" (ref. 101), 258.

[109] Harrison, *The Fall of man* (ref. 99), 13.

[110] On the role of mathematics in the development of empiricism see, for example, Jim Bennett, 'The mechanics' philosophy and the mechanical philosophy', *History of science,* xxiv (1986), 1-28; and Peter Dear, *Discipline and experience: The mathematical way in the Scientific Revolution* (Chicago, 1995). On the role of the revival of magic, see Paolo Rossi, *Francis Bacon: From magic to science* (London, 1968). For a survey of these and other historiographical themes on the origins of the experimental method, see John Henry, *The Scientific Revolution and the origins of modern science*, 3rd edition (Basingstoke: Palgrave, 2008), 33-68.

[111] It does not follow from this that controversy in either science or theology, or any other system of thought, is impossible. Nineteenth-century scientists who denied the possibility of organic evolution had a different set of connections in their network of beliefs than those who entertained the possibility of evolution. This model accounts for the difficulties involved in converting from one system of belief to another. Joseph Priestly could not have converted from a belief in dephlogisticated air to a belief in oxygen with just a few adjustments—it would have required a major re-configuration of the interconnected network of his beliefs—including his beliefs about Providence: why should God have given us air to breathe, when he could have given us the more superior oxygen? For a discussion of networks of belief, consider Mary Hesse, *The structure of scientific inference* (London, 1974).

[112] Funkenstein, *Theology and the scientific imagination* (ref. 7), 3. The attempt to refute atheism was particularly urgent given the fact that for many contemporaries, the new philosophies were all too often seen as promoting irreligion. See refs 11 and 16 above.

[113] It should be noted that the voluntarist Boyle defends mechanistic explanations against the hylarchic principle insisted upon by the intellectualist Henry More; but the voluntarist Newton prefers to leave the cause of gravity undetermined rather than provide a mechanistic account of the kind demanded by the intellectualist Leibniz. This again shows that the only way these matters can be properly understood is by looking at them in their specific historical context. See Henry, "Henry More versus Robert Boyle" (ref. 18); and Iltis, "The Leibnizian-Newtonian debates: Natural philosophy and social psychology" (ref. 19).

[114] Caroline to Leibniz, 10 January 1716, Alexander (ed.), *Leibniz-Clarke correspondence*, 193.

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