Galileo and the Inquisition

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On the occasion of the publication, in March 1987, of the Catholic Church's condemnation of *in vitro* fertilisation, surrogate motherhood, and foetal experimentation, there appeared a cartoon in a Roman newspaper, in which two bishops are standing next to a telescope. In the distant night sky, in addition to Saturn and the Moon, there are dozens of test-tubes. One bishop turns to the other, who is in front of the telescope, and asks: '*This* time what should we do? Should we look or not?'[1] Many see the Galileo affair as a prime example of the fundamental incompatibility between science and religion, between reason and faith. Stephen Hawking, in his recent best-seller, *A Brief History of Time,* writes a two-page biographical appendix on Galileo which offers ample evidence for the persistence of the view that the accomplishments of Galileo must be understood in the face of the opposition of Aristotelian science and Catholic theology. Galileo, Hawking claims, 'was one of the first to argue that man could hope to understand how the world works, and, moreover, that we could do this by observing the real world.'[2] Hawking, in commenting on his participation at a conference on cosmology sponsored by the Vatican at which he challenged traditional interpretations of Big Bang cosmology, evoked the image of himself as a potential Galileo:

> The Catholic Church had made a bad mistake with Galileo when it tried to lay down a law on a question of science, declaring that the sun went around the earth. Now, centuries later, it had decided to advise it on cosmology. At the end of the conference the participants had an audience with the pope. He told us that it was alright to study the evolution of the universe after the big bang, but we should not inquire into the big bang itself because that was the moment of Creation, and therefore the work of God. I was glad that he did not know the subject of the talk I had just given at the conference—the possibility that space-time was finite but had no boundary, which means that it had no beginning, no moment of Creation. I had no desire to share the fate of Galileo, with whom I feel a strong sense of identity, partly because of the coincidence of having been born exactly 300 years after his death![3]

Since the story of Galileo and the Inquisition is so much a part of

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our understanding of the relationship between religion and science in western history, it is especially useful to look again at the events of the early seventeenth century. The catalyst for the interest in the relationship between Copernican astronomy and Scripture is Galileo's telescopic observations of 1609, 1610, and 1611, and some of the conclusions drawn from them. These observations, as Galileo himself admitted, are not sufficient to demonstrate that in fact the earth moves about the sun. But the observations did call into question the received geocentric cosmology, and they were a powerful incentive for Galileo to discover a demonstration for the motion of the earth. Both Galileo and the Inquisition were well aware that spots on the Sun, mountains on the Moon, four satellites' revolving about Jupiter, Venus' showing phases are all compatible with a motionless earth. Thus, evidence other than what Galileo was able to see through his telescope would be needed to conclude that, in fact, the earth moved.

In 1615 a Neapolitan priest, Paolo Foscarini, published an essay in which he argued that the acceptance of Copernican astronomy raises no problems for the interpretation of Scripture. He sent his essay to Cardinal Robert Bellarmino, the learned Jesuit who was an important officer of the Inquisition. Bellarmino's response to Foscarini, a copy of which the Cardinal sent to Galileo, reveals the position of the Inquisition's leading authority:

> (I)t appears to me that ... (you — Foscarini) and Sig. Galileo did prudently to content yourselves with speaking hypothetically and not absolutely (*ex suppositione e non assolutamentel)*, as I have always believed Copernicus did. For to say that assuming the earth moves and the sun stands still saves all the appearance better than eccentrics and epicycles is to speak well. This has no danger in it, and it suffices for mathematicians. But to wish to affirm that the sun is really fixed in the centre of the heavens and merely turns upon itself, without travelling from east to west, and that the earth ... revolves very swiftly around the sun, is a very dangerous thing, not only by irritating all the theologians and scholastic philosophers, but also by injuring our holy faith by making the sacred Scripture false...[4]

Note the important distinction Cardinal Bellarmino draws between speaking 'hypothetically' and speaking 'absolutely'. To speak hypothetically, in the sense to which the Cardinal refers, is 'to save the appearances', and in astronomy, 'to save the appearances' is to provide a consistent mathematical *description* of the observed phenomena. Hence, Bellarmino refers to the eccentrics and epicycles of Ptolemaic astronomy, which are mathematical constructs to describe the observed movements in the heavens. On the other hand, to speak 'absolutely' would be to specify what the movements in the heavens really are.

Bellarmino also reminds Galileo that the traditional interpretation

of the Bible includes the exposition of certain passages as affirming the immobility of the earth. The Cardinal then asks rhetorically: 'Now consider whether, in all prudence, the Church could support the giving to Scripture of a sense contrary' to the traditional interpretation. But, significantly, Cardinal Bellarmino does not stop here; he makes an important final point:

> (I)f there were a true demonstration that the sun was in the centre of the universe ... and that the sun did not go around the earth but that the earth went around the sun, then it would be necessary to use careful consideration in explaining the Scriptures that seemed contrary, and we should rather have to say that we do not understand them than to say that something is false which had been proven. But I do not think there is any such demonstration, since none has been shown to me. To demonstrate that the appearances are saved by assuming the sun at the centre and the earth in the heavens is not the same thing as to demonstrate that in fact the sun is in the centre and the earth in the heavens. I believe that the first demonstration may exist, but I have very grave doubts about the second; and in the case of doubt one may not abandon the Holy Scripture as expounded by the holy fathers.[5]

Galileo shared Cardinal Bellarmino's understanding of the difference between an astronomy 'which saves the appearances' and an astronomy which demonstrates what is truly so. In a note to a friend in 1615, Galileo observed: 'Two kinds of suppositions (*supposizioni*) have been made ... by astronomers: some are primary and with regard to the absolute truth in nature; others are secondary, and these are posited imaginatively to render an account of the appearances in the movements of the stars....' These latter suppositions, designed to save the appearances, are, acording to Galileo, 'chimerical and fictive ... false in nature, and introduced only for the sake of astronomical computation.'[6] Galileo described his task as the discovery of the 'true constitution of the universe', an understanding which is 'unique, true, real, and which cannot be other than it is.'[7]

It is important to remember that the Aristotelian notion of science that was current in the age of Galileo is different from that of today. The Aristotelian ideal of scientific knowledge is that of knowledge that is certain through causes, or knowledge that cannot be otherwise because it is based on the discovery of the causes that make things be the way they are. Such sure, certain knowledge is quite different from the product of probable or conjectural reasoning: reasoning which lacks certitude because it falls short of identifying true and proper causes. Galileo, despite his disagreements with contemporary Aristotelians, never departed from Aristotle's ideal of science as sure, certain knowledge. Whether Galileo was arguing about the movement of the earth or about laws that govern the motion of falling bodies, his claim was invariably

for a view of scientific knowledge as demonstratively true.[8]

Cardinal Bellarmino exemplifies the same Aristotelian position: namely, that the natural scientist discovers the truths of nature. Thus, he demands that if Galileo, the scientist, wishes to argue for the truth of Copernican astronomy, that is, if he wishes to speak 'absolutely', he must provide a demonstration for the motion of the earth: after all, that is what a good scientist does. Without a demonstration a scientist cannot conclude that, in fact, the earth moves. It is important to note that our contemporary notion that science only deals with models or paradigms or approximations of the truth would be rejected by Aristotle, Bellarmino, and Galileo.

The philosophical arguments advanced in the early 17th century against the motion of the earth were generally based on the assumption that a geocentric astronomy was an essential part of a larger Aristotelian cosmology: the view, that is, that Aristotelian physics and metaphysics depended in some way on the affirmation that the Earth was immobile at the centre of the universe. Thus, if one were to reject such a geocentric astronomy, then the whole of Aristotelian science would have to be discarded. As a result of such an understanding of the interdependence of astronomy, cosmology, physics, and metaphysics, the acceptance of a moving Earth would involve a radical philosophical revolution. Hence, we might understand why many of Galileo's contemporaries were so troubled by his support for Copernican astronomy. Furthermore, although we now accept without question that the Earth moves, we need to guard against assuming that it was a simple matter to reach this conclusion and that therefore the scientific opponents of Galileo were either simple-minded or stubbornly blind to the truth.

In order to examine in greater detail the theological dimension of the encounter between Galileo and the Inquisition, we shall have to keep in mind this question concerning the scientific knowledge of the motion of the Earth. Remember, Cardinal Bellarmino said that if there were a demonstration for the motion of the Earth, then Scripture would have to be interpreted accordingly. The Cardinal has simply reiterated traditional Catholic teaching that the truths of science and the truths of faith cannot contradict one another. Whether we turn to Augustine in the late fourth century or Aquinas in the thirteenth, we can discover the common Catholic commitment to the harmony between reason and revelation. Furthermore, both Augustine and Aquinas warned against using the Bible as an encyclopedia of natural science. In this repect, Galileo liked to quote the remark of Cardinal Baronius: Scripture teaches you how to go to heaven, not how the heavens go. In 1615, when Galileo addresses this same topic, he reaffirms traditional Catholic teaching:

> I think that in discussion of physical problems we ought to begin not from the authority of scriptural passages, but from sense-experiences and necessary demonstrations; for the holy

> Bible and the phenomena of nature proceed alike from the Divine Word .... It is necessary for the Bible, in order to be accommodated to the understanding of every man, to speak *many things which appear to differ from the absolute truth* so far as the bare meaning of the words is concerned. But Nature, on the other hand, is inexorable and immutable; she never transgresses the laws imposed upon her, or cares a whit whether her abstruse reasons and methods of operations are understandable to men. For that reason it appears that nothing physical which sense-experience sets before our eyes, or which necessary demonstrations prove to us, ought to be called in question (much less condemned) upon the testimony of biblical passages which may have some different meaning beneath their words. For the Bible is not chained in every passage to conditions as strict as those which govern all physical effects; nor is God any less excellently revealed in Nature's actions than in the sacred statements of the Bible.[9]

In the absence of a scientific demonstration for the motion of the Earth, Cardinal Bellarmino urged prudence: do not challenge the traditional readings of those biblical passages which have been interpreted as affirming the immobility of the earth. The Cardinal was acutely aware of the Protestant challenges to the Catholic Church's claim to be the sole, legitimate interpreter of God's word. Nevertheless, on the level of the principles concerning the relationship between science and Scripture Cardinal Bellarmino and Galileo were in agreement, just as they were in agreement concerning the Aristotelian requirements for scientific knowledge. God is the author of the book of Nature and of the book of Scripture. The truths of Nature and Scripture cannot contradict one another. Indeed, there even seems to be a further agreement between the two men: not only are the Bible and science complementary, but there is a concordance between them. That is, although the principal purpose of Scripture is salvation, the Bible does contain some scientific truths. Galileo, himself, claims:

> ... having arrived at any certainties in physics, we ought to utilise these as the most appropriate aids in the true exposition of the Bible and in the investigation of those meanings which are necessarily contained therein, for these must be concordant with demonstrated truths.
>
> (Since) two truths cannot contradict one another ... it is the function of wise expositors (of Scripture) to seek out the true senses of scriptural texts. These will unquestionably accord with the physical conclusions which manifest sense and necessary demonstrations have previously made known to us.

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> These senses (of scriptural passages concerning 'questions of nature which are not matters of faith') would unquestionably be discovered by wise theologians, together with the reasons for which the Holy Ghost sometimes wished to veil itself under different meaning....[10]

Both Galileo and the Inquisition share the view that there is not simply a complementarity between the Bible and science, in that the truth of one cannot contradict the truth of the other, but that there also must be a concordance between science and those passages in the Bible which seem to make claims about the physical nature of our universe. It is, I think, precisely because of this commitment to the possibility of discovering truths of science in the Bible that we can begin to understand the nature of the controversy between Galileo and the Inquisition: a controversy which is not between science and religion but within a shared commitment to the complementarity of science and religion.

What happens in 1616 is that what was for Cardinal Bellarmino prudential advice—viz., do not tamper with the Church's traditional reading of the Bible with respect to particular passages with implications for astronomy—is elevated to a theological principle by the Inquisition. When called upon to examine the orthodoxy of the new astronomy, a committee of theological experts of the Inquisition reported that it was heretical to maintain that the Earth moves and the sun stands still. On the basis of this committee report, Copernicus's book is ordered to be corrected and Galileo is informed that he is not to hold, teach, or defend Copernican astronomy. It is this order to Galileo which serves as the basis for his trial in 1633.

The actions of the Catholic Church in 1616 were administrative and judicial rulings; they were not dogmatic pronouncements. Such decisions do not commit the Church to a particular theological position. Nevertheless, the conclusions of that committee of theological experts are not only wrong, but at variance with the theological and philosophical traditions of Catholicism. Galileo's arguments for the complementarity between science and Scripture simply reaffirm the orthodox Catholic view. In fact, Galileo was convinced that his chief opponents were narrow-minded Aristotelian philosophers in the universities and that his chief allies were in the Church. Galileo remarked that his philosophical adversaries, unable to refute him scientifically, 'have resolved to fabricate a shield for their fallacies out of the mantle of pretended religion and the authority of the Bible.'[11] He sought to encourage his Church not to make the mistake of listening to the bad advice of his opponents. If Galileo's position is consistent with Catholic tradition, how do we account, then, for the condemnations issued by theologians of the Inquisition in 1616?

When the theological experts of the Inquisition condemned the propositions that the earth moves and the sun stands still I think that they saw their task as a straight-forward application of the decrees of the

Council of Trent concerning the proper interpretation of Scripture. The issue seemed simple: the Bible and the teaching of the Church Fathers affirm the mobility of the sun and the immobility of the earth; to argue the contrary was to deviate from the traditional interpretation of Scripture. In the face of the Reformation, the Catholic Church was particularly alert to threats, real or imaginary, to traditional interpretations of the Bible.

Let us recall, further, that a crucial feature of the disputes of the Reformation was the calling into question by the Reformers of the very criterion of truth by which one resolves theological questions. In other words, the Reformation was not simply a debate about grace, free will, predestination, and the like, but it also involved a debate about the Catholic Church's claim to be the authentic judge of such disputes. Although Protestants and Catholics would disagree about the role of the Church as a criterion of truth, they could, however, and they did, appeal to a common text, the Bible, a text which, in a sense, standing alone, served as the only common ground from which to argue. Both sides, thus, were encouraged to find in the Bible evidence for their respective theological conclusions. The Bible, therefore, came to be treated as a reservoir of conflicting theological propositions. Thus, we find a tendency on the part of both Protestants and Catholics to treat the Bible as a theological text book: a compendium of syllogisms or dogmatic propositions. One of the obvious dangers in viewing the Bible as a text book in theology is a literalistic reading of the text: a literalism all too apparent in the Inquisition's reactions to the perceived threat of the new astronomy.

We need to remember also that Protestants had criticised the Catholic Church for its use of Aristotelian philosophy in support of its doctrines. For example, the Catholic Church's explanation of the real presence of Christ in the Eucharist—the doctrine of transubstantiation—employs Aristotelian categories of substance and accident.[12] Just as some philosophers mistakenly concluded that Aristotelian physics and metaphysics depended on a geocentric astronomy, so some theologians, accepting such a reciprocal dependence between astronomy and physics, also thought that to affirm the motion of the earth would render invalid Aristotelian physics, a physics upon which important elements of Catholic theology depended. Luther attacked Aristotle; Galileo seemed to attack Aristotle: it was not difficult to draw the erroneous conclusion that to defend Aristotle is to defend the faith, and that to defend Aristotle requires that one defend a geocentric universe.

The theologians of the Inquisition, committed as they were to the complementarity between science and Scripture, accepted as incontrovertibly true a particular geocentric cosmology, and, on the basis of such a commitment, insisted that the Bible be read in a certain way. Thus, in part, they subordinated scriptural interpretation to a

physical theory! The famous trial of Galileo, seventeen years later in 1633, after the publication of his *Dialogue Concerning the Two Chief World Systems,* depends upon the events of this earlier period. The theological, philosophical, and scientific questions which constitute the heart of the controversy are clear by 1616.

Finally, let us not be too harsh in judging the errors of the Inquisition. Remember that Galileo did not have what he recognised he must have: a demonstration for the motion of the Earth. That is, he knew that scientific knowledge requires demonstrations, and it was precisely such knowledge to which he was committed. At one time he thought that the phenomena of the ocean tides would supply such a demonstration. He also admitted that were it possible in his time to observe stellar parallax, then he would have at his disposal the necessary information to prove that the Earth moves. But such knowledge eluded him. Thus, when the Inquisition, at his trial in 1633, required that he affirm, as a matter of faith, that the Earth does not move, the Inquisition was not demanding that Galileo choose between science and religion. The officers of the Inquisition did not think that there was a demonstration for the motion of the Earth and thus they did not think that they were asking Galileo to deny science in the name of religion. Since Galileo knew that science requires demonstrations, he would not have thought that he was being required to choose faith over against reason. Thus, Galileo in good conscience—that is, as a good Catholic and a good scientist—could affirm that he did not hold that the Earth moves. No matter how convinced Galileo was that the Earth moves, in the absence of scientific knowledge that the Earth moves, he could believe that it did not.[13]

Galileo is a man of the two cities of faith and reason. With Augustine and Aquinas, he recognised that there can be no real conflict between science and religion, between the book of Nature and the book of Scripture. Conflicts between the two arise, according to Galileo, only when we fail to distinguish the proper domains of each or when we fail to proceed properly in either. The controversy between Galileo and the Inquisition did not come about because Galileo represented modern science in its embryonic stage, fighting to free itself from the domination of medieval theology. Rather, the controversy occurred because Galileo was, in important respects, a good Thomist and Aristotelian who was reaffirming the traditional Catholic understanding of faith and reason. Despite the errors of the Inquisition, if we examine the case of Galileo we do not discover evidence for the hostility between science and religion, but rather evidence of a conflict within shared values of the complementarity between science and religion.

1 *la Republica* 15/16 marzo 1987.

2 Stephen W. Hawking, *A Brief History of Time* (London & New York: Bantam Books 1988), pp. 179—180.

3 *ibid.*, p. 116. For a discussion of the relationship between variations in Big Bang cosmology and the doctrine of creation, see my 'Big Bang Cosmology, Quantum Tunneling From Nothing, and Creation,' in *Laval théologique et philosophique,* 44:1, février 1988, pp. 59—75.

4 Cardinal Robert Bellarmino to Paolo Foscarini, 15 April 1615, translated in Stillman Drake, *Discoveries and Opinions of Galileo,* p. 163. I have made a few changes in Drake's translation.

5 *ibid.*

6 Galileo, *Opere,* Vol. 5, 357—359.

7 *Opere,* Vol. V, 102.

8 See William A. Wallace, *Galileo and His Sources: The Heritage of the Collegio Romano in Galileo's Science.* In this and other publications Wallace has demonstrated Galileo's commitment to the Aristotelian ideal of scientific knowledge.

9 Galileo, 'Letter to the Grand Duchess Christina,' in S. Drake, *Discoveries and Opinions of Galileo,* pp. 182—3.

10 *ibid.*, pp. 183, 186, and 199.

11 *ibid.*, p. 179.

12 In a recent work, *Galileo eretico,* Pietro Redondi, claims that it was precisely Galileo's commitment to atomism, as found in *The Assayer,* that was the real source of his troubles with the Church. Despite Redondi's many insights concerning the theological and philosophical world in which the trial occurred, his specific thesis that the dispute concerning the relationship between Copernican astronomy and the Bible was part of a shadow theatre which concealed the serious dispute over Eucharistic theology is hardly satisfactory.

13 For a fuller exposition of this view, see William A. Wallace, 'Galileo and Aristotle in the *Dialogo,*' in *Angelicum,* Vol. 60 (1983), pp. 311—332.

Professors Michael Dummett and Nicholas Lash

Commenting on the responses to his article in the October 1987 issue of *New Blackfriars,* 'A Remarkable Consensus', Professor Michael Dummett wrote on page 532 of *New Blackfriars* for December 1988 that 'most of the contributors propose that we should re-invent it (the Christian religion) or that we should allow the experts to do so.' Having received assurance that Professor Michael Dummett wishes to stand by this assertion, Professor Nicholas Lash wishes to withdraw his statement on page 82 of the February 1989 issue that 'once again, as in his original article, Professor Dummett does not seem much to care whether the grave accusations that he makes are true or false'. He had simply assumed that such an assertion could not have been deliberately intended and apologises for any offence given.
