

Science, Religion, and the Historiography of the Galileo Affair: On the Undesirability of $\ensuremath{\mathsf{Oversimplication}}$

Author(s): Maurice A. Finocchiaro

Source: Osiris, 2001, Vol. 16, Science in Theistic Contexts: Cognitive Dimensions (2001), pp. 114-132

Published by: The University of Chicago Press on behalf of The History of Science Society

Stable URL: https://www.jstor.org/stable/301982

REFERENCES

Linked references are available on JSTOR for this article: https://www.jstor.org/stable/301982?seq=1&cid=pdfreference#references_tab_contents You may need to log in to JSTOR to access the linked references.

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact support@jstor.org.

Your use of the JSTOR archive indicates your acceptance of the Terms & Conditions of Use, available at https://about.jstor.org/terms



The History of Science Society and The University of Chicago Press are collaborating with JSTOR to digitize, preserve and extend access to Osiris

Science, Religion, and the Historiography of the Galileo Affair On the Undesirability of Oversimplication

By Maurice A. Finocchiaro*

I. RECENT HISTORIOGRAPHICAL CRITIQUES

Many scholars have recently questioned the fruitfulness of traditional accounts of the history of the relationship between science and religion.¹ I believe a general consensus has emerged to the effect that the two major traditional approaches to the topic are both oversimplifications: that is, the approach that interprets the relationship as one of conflict, and the approach that construes the connection as one of harmony. A key flaw of both accounts is that they are really hasty generalizations: there is indeed conflict in some historical episodes, but not in others; and the same is true for harmony. Another important flaw is that traditional approaches tend to presuppose definitions of science and religion which are essentialist, anachronistic, or unhistorical. There also seems to be a general consensus that the variety of relationships is much richer and more complex than the notions of conflict and harmony

* Department of Philosophy, University of Nevada-Las Vegas, Las Vegas NV 89154-5028.

For support of research resulting in this essay, the author gratefully acknowledges the following: the Guggenheim Foundation, for a one-year fellowship in 1998–1999; the Program in Science and Technology Studies of the National Science Foundation, for a three-year grant (no. SBR-9729117) in 1998–2001; the Department of History of Science at Harvard University for Visiting Scholar privileges in 1998–1999; and the University of Nevada, Las Vegas, for a one-year research leave in 1998–1999.

¹ The views stated in this paragraph are gleaned from these authors: John H. Brooke, *Science and Religion: Some Historical Perspectives* (Cambridge: Cambridge Univ. Press, 1991); idem, "Religious Belief and Natural Science: Mapping the Historical Landscape," in *Facets of Faith and Science*, ed. Jitse M. van der Meer, 4 vols., vol. 1: *Historiography and Modes of Interaction* (Lanham, Md.: Univ. Press of America, 1996), pp. 1–26; idem, "The Historiography of Religion and Science Interaction" (paper presented at the conference "Science in Theistic Contexts: Cognitive Dimensions," Pascal Centre for Advanced Studies in Faith and Science, Redeemer College, Ancaster, Ontario, Canada, 21–5 July 1998); John Brooke and Geoffrey Cantor, *Reconstructing Nature: The Engagement of Science and Religion* (Edinburgh, Scotland: T & T Clark, 1998); David C. Lindberg and Ronald L. Numbers, eds., *God and Nature: Historical Essays on the Encounter between Christianity and Science* (Berkeley and Los Angeles: Univ. California Press, 1986); idem, "Beyond War and Peace: A Reappraisal of the Encounter between Christianity and Science," *Perspectives on Science and Christian Faith* 39 (1987):140–9; David N. Livingstone, "Science and Religion: Towards a New Cartography," *Christian Scholar's Review* 26 (1997):270–92; James R. Moore, "Speaking of 'Science' and 'Religion'—Then and Now," *Hist. Sci.* 30 (1992):311–23; Martin Rudwick, "Senses of the Natural World and Senses of God: Another Look at the Historical Relation of Science and Religion,"

© 2001 by The History of Science Society. All rights reserved. 0369-7827/01/1601-0001\$2.00

Osiris, 2001, 16:00-00

114

This content downloaded from 46.198.240.194 on Tue, 04 Apr 2023 09:23:34 UTC All use subject to https://about.jstor.org/terms can convey. For example, one cannot neglect such other possibilities as separation, dialogue, integration, and subordination.² Even within the concept of conflict, we should add the notion of (peaceful) competition to that of warfare, and within the notion of harmony, it is extremely important to distinguish the direction of influence, whether from religion to science or from science to religion. And in any case, there are several different kinds of influence: presupposition, sanction, motive, prescription, and substantive source. And the relata are no less complex than the relationship: science can refer, for example, to the contexts of discovery, justification, or popularization; and religion can refer to theology, metaphysics, worldview, myth, ritual, and ecclesiastic institutions, for example.

I am not sure I would go so far as to agree with the proposal to abandon the terms "science" and "religion" altogether, advanced by some scholars.³ And I am not sure the situation for this topic is any more problematic than other situations, such as those involving the questions of the relationship between science and society, science and politics, science and philosophy, science and rhetoric, and science and art.⁴ Nevertheless, the collective weight of these historiographical discussions of science and religion is such that one can hardly conduct business as usual when one is engaged in studying some historical episode relevant to both science and religion. The purpose of this essay is to offer some reflections on the Galileo affair in the light of the above-mentioned historiographical literature, and with an eye toward making additional historiographical distinctions as needed.⁵

² Besides the authors mentioned in n. 1, this variety of relationships has also been discussed by Michael Ruse, introduction to Bertrand Russell, *Religion and Science* (1935) (Oxford: Oxford University Press, 1997), pp. v-xxii.

³ Margaret J. Osler, "Mixing Metaphors: Science and Religion or Natural Philosophy and Theology in Early Modern Europe," *Hist. Sci.* 36 (1998):91–113; David B. Wilson, "On the Importance of Eliminating *Science* and *Religion* from the History of Science and Religion," in van der Meer, *Facets* of *Faith and Science* (cit. n. 1); and idem, "Galileo's Religion versus the Church's Science," *Physics in Perspective* 1 (1999):65–84.

⁴ For a flavor of such problems, see, e.g., Maurice A. Finocchiaro, "Science and Society in Newton and in Marx," *Inquiry* (Oslo) 31 (1988):103–21; and idem, "Varieties of Rhetoric in Science," *Hist. Hum. Sci.* 3 (1990):177–93.

⁵ John Brooke and Geoffrey Cantor, in their Glasgow Gifford Lectures, have also carried out such an exercise. Their discussion is now available in their *Reconstructing Nature* (cit. n. 1), chap. 4, "The Contemporary Relevance of the Galileo Affair," pp. 106–38. My account can thus be read in conjunction with theirs. I believe, however, that despite our overlapping topic, aim, and approach, there are some differences: their main concern seems to be to give a statement and criticism of the conflict thesis, and for several other interpretations to give primarily a historical contextualization and historiographical characterization; whereas in this essay my main concern is evaluation, both constructive and critical, and my targets are the harmony thesis as well as the conflict thesis, and anticlerical as well as apologetic accounts. Earlier, Geoffrey Cantor had also carried out a similar exercise, which, while it overlaps with his joint effort in *Reconstructing Nature*, also contains additional interesting and important points; see Geoffrey Cantor, "Science, Religion and History: How should we reassess the position of Galileo?" *Univ. Leeds Rev.* 38 (1995–1996):1–19.

in *The Sciences and Theology in the Twentieth Century*, ed. Arthur R. Peacocke (Notre Dame, Ind.: Univ. of Notre Dame Press, 1981), pp. 241–61; David B. Wilson, "On the Importance of Eliminating *Science* and *Religion* from the History of Science and Religion," in van der Meer, *Facets of Faith and Science*, vol. 1, pp. 27–48; idem, "The Historiography of Science and Religion," in *The History of Science and Religion*, and Darrel W. Amundsen (New York: Garland, 2000); Stephen J. Wykstra, "Have worldviews shaped science? A Reply to Brooke" in van der Meer, *Facets of Faith and Science*, vol. 1, pp. 91–114; and idem, "Should worldviews shape science?: Toward an Integrationist Account of Scientific Theorizing," in van der Meer, *Facets of Science and Faith*, vol. 2, pp. 123–71.

MAURICE A. FINOCCHIARO

II. CONFLICTUAL INTERPRETATIONS

Let us begin by examining the conflict thesis. Because the Galileo affair involved a conflict between one of the founders of modern science and one of the world's great religions, it has traditionally been seen as an example of the conflict between science and religion, or at least science and Christianity, or science and Roman Catholicism.⁶ This interpretation is initially plausible, but I am not sure it is ultimately correct. For the relevant documents show that many churchmen were on his side and many scientists were critical of him. For example, in 1615–1616 he received the support of Monsignor Piero Dini and Carmelite Father Paolo Antonio Foscarini, and after the condemnation of 1633 his tragedy was significantly alleviated by Ascanio Piccolomini, archbishop of Siena, and Fra Fulgenzio Micanzio, theologian to the Republic of Venice.7 Moreover, the attitude of some of the key ecclesiastical players was nuanced and complex: Cardinal Robert Bellarmine helped Galileo in some ways and hindered him in others in 1613–1616, and Pope Urban VIII was his friend and patron until 1632 and turned against him only thereafter. On the other hand, the opposition to Galileo from Jesuits Christopher Scheiner and Orazio Grassi involved primarily scientific issues such as the discovery and interpretation of sunspots and the interpretation of comets, so it must be regarded primarily as the opposition of scientific peers who happened to disagree with him. Thus, we may say that there was a split within both science and religion, and that the real conflict was between two things which I shall call a conservative and a progressive attitude.

These terms are not actor's categories, and their employment runs the risk of anachronism. However, they are useful notions and refer to a phenomenon which is an essential aspect of the way in which human history develops.⁸ This is the tension between the old and the new, between tradition and innovation, between preserving what already exists and changing it in some way.

Thus it is not surprising that similar comments would apply to attempts, such as that of Stillman Drake,⁹ to show that the root cause of the affair was a conflict be-

⁷ Cf. Maurice A. Finocchiaro, ed. and trans., *The Galileo Affair: A Documentary History* (Berkeley and Los Angeles: Univ. of California Press, 1989).

⁹ See Stillman Drake, Galileo against the Philosophers (Los Angeles: Zeitlin & Ver Brugge, 1976); idem, Galileo at Work: His Scientific Biography (Chicago: Univ. of Chicago Press, 1978); and idem, Galileo (New York: Hill & Wang, 1980). Drake's account is only a recent version of a type of interpretation that goes back at least to Henri de L'Epinois, "Galilée, son procès, sa condamnation d'après des documents inédits," Revue des Questiones Historiques 3 (1867):68–171, especially pp. 143– 5; idem, Les Pièces du procès de Galilée précedées d'un avant-propos (Paris: Victor Palmé, 1877);

⁶ E.g., see John W. Draper, *History of the Conflict between Religion and Science* (New York: D. Appleton and Company, 1875); Andrew D. White, *A History of the Warfare of Science with Theology in Christendom*, 2 vols. (New York: D. Appleton and Company, 1896), vol. 1, pp. 130–52; and idem, *A History of the Warfare of Science with Theology in Christendom*, abridged ed. by Bruce Mazlish (New York, 1965). Because of their explicitness and militancy, Draper and White can be regarded as the classic sources of the conflict thesis, and they have been the main targets of the recent criticism. However, the conflict thesis may be gleaned from more significant authors, who are classical in other ways: for example, Albert Einstein, foreword to Galileo Galilei, *Dialogue Concerning the Two Chief World Systems*, ed. and trans. Stillman Drake (Berkeley and Los Angeles: Univ. California Press, 1953), pp. vi–xx; John Milton, *Areopagitica* ed. J. W. Hales (1644; Oxford: Oxford Univ. Press, 1961), p. 35; and Karl R. Popper, "Three Views of Human Knowledge" (1956), now in his *Conjectures and Refutations* (New York: Harper, 1963), pp. 97–119.

⁸ E.g., cf. Thomas S. Kuhn, *The Essential Tension: Selected Studies in Scientific Tradition and Change* (Chicago: Univ. of Chicago Press, 1977).
⁹ See Stillman Drake, *Galileo against the Philosophers* (Los Angeles: Zeitlin & Ver Brugge, 1976);

117

tween science and philosophy. By "philosophy" here Drake means academic professional philosophy, namely professors of philosophy. But in regard to "science," it is unclear whether Drake means professors of mathematics or natural philosophers who did not hold a university position. Thus, it is unclear whether the alleged contrast is between professors of philosophy and professors of mathematics, or between academic and nonacademic natural philosophers. To fix the discussion, let us focus on the alleged conflict between Galileo and his "philosophical" opponents, that is, on his relationship with persons who held academic positions in philosophy or had some other kind of philosophical pretension or claim.

When we do this we find that, on the one hand some philosophers were critical of Galileo and displayed various degrees of opposition to him, from the militant anti-Galileanism of Ludovico delle Colombe in 1611 to the philosophical criticism of René Descartes in the 1630s, with intermediate cases such as Cosimo Boscaglia and Scipione Chiaramonti. On the other hand, philosopher Tommaso Campanella was constantly supportive of Galileo despite the fact that he himself was frequently in more trouble than Galileo; he even published an Apologia pro Galileo in 1622.10 Moreover, the attitude of some leading establishment philosophers was, again, nuanced and complex, if one examines all aspects of their interaction with Galileo; this would be the case for two professors of philosophy at the University of Padua, Cesare Cremonini and Fortunio Liceti. Finally, of course, one cannot ignore Galileo's own philosophical pretensions-for example, his "claim to have spent more years studying philosophy than months studying pure mathematics,"¹¹ as well as his insistence on and success in obtaining the title of Philosopher to the grand duke of Tuscany, besides Chief Mathematician. Thus, we cannot replace the alleged warfare between science and religion with the alleged conflict between science and philosophy; rather we may want to resort, once again, to the conflict between a conservative and a progressive attitude.

The importance of the dialectic of conservation and innovation is also shown by the fact that this notion manages to reassert itself in the context of recent studies which break new ground by turning away from the tradition of conflicts between science and other disciplines. For example, although criticizing the tradition of portraying the original affair as a clash between reason and unreason, Rivka Feldhay argues that the Roman Catholic Church was not a monolithic institution, and that the Dominicans represented its conservative wing and the Jesuits its progressive wing.¹² However, the Dominicans and the Jesuits were by no means a monolithic entity either, a point that Feldhay admits but does not sufficiently exploit.

For example, there seems to have been some disagreement between two of Galileo's Jesuit enemies: Christopher Scheiner, with whom Galileo was embroiled in a

and idem, La Question de Galilée, les faits et leurs conséquences (Paris/Brussels: Victor Palmé, 1878).

¹⁰ Cf. Richard J. Blackwell, ed. and trans., *A Defense of Galileo, the Mathematician from Florence by Thomas Campanella* (Notre Dame, Ind.: Univ. of Notre Dame Press, 1994).

¹¹ Galileo Galilei, *Le Opere di Galileo Galilei*, 20 vols., "National Edition," ed. A. Favaro (Florence: Barbèra, 1890–1909), vol. 10, p. 353.

¹² Rivka Feldhay, *Galileo and the Church: Political Inquisition or Critical Dialogue?* (Cambridge: Cambridge Univ. Press, 1995). The progressiveness of the Jesuits, as well as their influence on Galileo, has been documented by William A. Wallace, *Galileo and His Sources* (Princeton: Princeton Univ. Press, 1984).

controversy about sunspots, and who is sometimes seen as the instigator of the 1633 trial; and Melchior Inchofer, who in April 1633 wrote one of three consultant reports on Galileo's Dialogue, used by the Inquisitors as evidence that Galileo had defended and come close to holding the thesis of the earth's motion. A recent study by Michael Gorman calls attention to a document recently discovered in the archives of the Society of Jesus in Rome.¹³ It is Scheiner's evaluation of a book manuscript by Inchofer. The evaluation was written on 9 August 1633, and the book was published the same year under the title *Tractatus Syllepticus*. Scheiner's evaluation is generally positive, and he recommends publication. However, he expresses two reservations: that Inchofer goes too far and should moderate his claims that (1) questions of the location and behavior of the earth and sun are matters of faith, and (2) biblical authority "is greater than the capacity of any human mind."¹⁴ Aside from suggesting that Scheiner was not the moving force behind Galileo's trial of 1633, this suggests that there was a split within the Jesuit order and that Inchofer was a member of the conservative wing. However, it also suggests that Scheiner was partly progressive and partly conservative. Indeed, I would go farther and find a split between conservative and innovative tendencies within the minds of many key players, including Galileo, Cardinal Bellarmine, and Pope Urban VIII.¹⁵

Before concluding this discussion of the conflict thesis, we should note that there are sophisticated versions of it which are hard to fault and may very well be unavoidable. Two essays have just been published by philosophers who may be considered to be fully cognizant of the complexity of the historical relationship between science and religion and of the untenability of extreme, oversimplified accounts. They both support the claim, not that conflict is necessary or unavoidable, but that the potential for conflict between science and religion is always present, and that new cases similar to the Galileo affair may arise in the future.

In particular, Richard Blackwell argues plausibly that "religious authority, at least in the Catholic tradition, is monolithic, centralized, esoteric, resistant to change, and self-protective. By contrast, authority in science . . . is pluralistic, democratic, public, fallibilistic, and self-corrective."¹⁶ In other words, if we focus not on particular beliefs but on the mindset fostered by science and religion, respectively, as they have in fact developed in the West since the time of Galileo's trial, we discover a difference and a potential conflict. I believe Blackwell is even willing to admit that science and religion might have developed differently from the way they have actually developed, but that given their actual development in the last four centuries, the possibility of trouble can never be dismissed.

¹³ Michael J. Gormam, "A Matter of Faith? Christoph Scheiner, Jesuit Censorship, and the Trial of Galileo," *Perspect. Sci.* 4 (1996):283–320. On Inchofer, see also William R. Shea, "Melchior Inchof-er's 'Tractatus Syllepticus': A Consultor of the Holy Office Answers Galileo," in *Novità celesti e crisi del sapere*, ed. Paolo Galluzzi (Florence: Barbéra, 1984), pp. 283–92. ¹⁴ Gorman, "A Matter of Faith?" (cit. n. 13), p. 316.

¹⁵ It is interesting that, for the case of Darwinism, a similar phenomenon has been found by James R. Moore, The Post-Darwinian Controversies: A Study of the Protestant Struggle to Come to Terms *with Darwin in Great Britain and America* (Cambridge: Cambridge Univ. Press, 1979), pp. 102–3; this point has been stressed by Lindberg and Numbers, "Beyond War and Peace" (cit. n. 1), p. 147. ¹⁶ Richard J. Blackwell, "Could there be another Galileo case?" in *The Cambridge Companion to Galileo*, ed. Peter Machamer (Cambridge: Cambridge Univ. Press, 1998), pp. 348–66, on p. 359; see

also idem, Galileo, Bellarmine, and the Bible (Notre Dame, Ind.: Univ. of Notre Dame Press, 1991); and idem, Science, Religion and Authority: Lessons from the Galileo Affair (Milwaukee, Wis.: Marquette Univ. Press, 1998).

A complementary account has been given by Marcello Pera.¹⁷ Approaching the topic from a very different angle, Pera has argued that the trial of Galileo involved a conflict between two principles: that (1) science can investigate any factual question and end up rejecting any factual claim; and that (2) some factual questions are essential to religious faith and cannot be rejected by a believer, on pain of abandoning religion. Examples of the latter are the questions of whether the physical universe is infinite in time (that is, whether it is eternal or had a beginning) and whether the soul survives after death.¹⁸ He attributes the first principle to Galileo, and the second one to Bellarmine. Although these attributions are not unfounded, they are questionable. However, the critical point here is that the Galileo affair has implications that are problematic for the science-religion relationship. For, if we accept Galileo's claim that the Bible is not an authority on astronomical questions, then presumably we would want to extend this claim to include physical questions; then it is tempting to step onto the slippery slope of generalizing to questions of biology, psychology, and history. At some point the conflict with religious belief is unavoidable.

III. POPE JOHN PAUL'S HARMONY THESIS

Let us now see how the harmony thesis fares, for, strange as it may seem, there have been those who have attempted to reverse the traditional conflictual interpretation by claiming that the Galileo affair illustrates the harmony between science and religion. A clear and explicit exponent of this harmony thesis is Pope John Paul II.¹⁹

In 1979, Pope John Paul II began a process which the popular media as well as some scholars labeled variously as the "rehabilitation" of Galileo and as the admission of an error on the part of the Roman Catholic Church.²⁰ The occasion was a speech delivered by the pope to the Pontifical Academy of Sciences at the commemoration of the centennial of Albert Einstein's birth. The pope expressed his regret for Galileo's suffering "at the hands of men and organisms of the Church,"²¹ and he

¹⁷ Marcello Pera, "The God of the Theologians and the God of the Astronomers: An Apology of Bellarmine," in Machamer, *The Cambridge Companion to Galileo* (cit. n. 16), pp. 367–88.

¹⁸ Although Pera does not mention Giordano Bruno in this connection, it is interesting to note that such claims played a key role in Bruno's eventual condemnation and execution; thus, the situation discussed by Pera has more than mere hypothetical interest. Cf. Luigi Firpo, *Il Processo di Giordano Bruno*, ed. Diego Quaglioni (Rome: Salerno, 1993), especially pp. 80–4.

¹⁹ John Paul II, "Deep Harmony Which Unites the Truths of Science with the Truths of Faith," L'Osservatore Romano, English edition, 26 Nov. 1979, p. 9, reprinted in Galileo Galileo: Toward a Resolution of 350 Years of Debate—1633–1983, ed. Paul Poupard (Pittsburgh: Duquesne Univ. Press, 1987), pp. 195–200; idem, "The Collaboration of Science and Religion," Origins: CNS Documentary Service 21 (18) (1991):281, 283; idem, "Faith can never conflict with reason," L'Osservatore Romano, English edition, 4 Nov. 1992, pp. 1–2; idem, "Messaggio di Sua Santità Giovanni Paolo II," in Galileo a Padova, 1592–1610: Celebrazioni del IV centenario, 7 dicembre 1991–7 dicembre 1992/ Università degli Studi di Padova, 5 vols., vol. 4: Tribute to Galileo in Padua: International Symposium, a cura dell'Università di Padova, Padova, 2–6 dicembre 1992 (Trieste, Italy: Edizioni LINT, 1995), pp. 9–11; and idem, "Lettera di Sua Santità Giovanni Paolo II al Prof. Pietro Dalphiaz," in Copernico e la questione copernicana in Italia, ed. Luigi Pepe (Florence: Olschki, 1996), pp. xi–xiii. Cf. George V. Coyne, M. Heller, and J. Zycinski, eds., The Galileo Affair: A Meeting of Faith and Science (Vatican City: Specola Vaticana, 1985); and Robert J. Russell, W. R. Stoeger, and G. V. Coyne, eds., John Paul II on Science and Religion: Reflections on the New View from Rome (Vatican City: Vatican Observatory Publications; Notre Dame, Ind.: Univ. of Notre Dame Press, 1990).

 ²⁰ E.g., see Michael Sharratt, *Galileo, Decisive Innovator* (Cambridge, Mass.: Blackwell, 1994).
 ²¹ John Paul II, "Deep Harmony" (cit. n. 19), p. 9.

quoted the Second Vatican Council's general condemnation of such interference with freedom of speech and of thought. He went on to state his full support for new and deeper studies of the affair, if conducted in a spirit which he described as "loyal recognition of wrongs from whatever side they come."22 Then he focused on three particular points: (1) that Galileo not only believed that religious and scientific truths cannot contradict each other, but the reason he gave for this belief was essentially identical to the reason given by the Second Vatican Council (1962–1965); (2) that he conducted his scientific research in the same spirit of piety and divine worship which the same council recommended as exemplary; and (3) that he formulated important epistemological norms about the relationship between science and the Bible that the Church later recognized as correct. The pope summarized his own interpretation of the episode with these words: "[I]n this affair the agreements between religion and science are more numerous and above all more important than the incomprehensions which led to the bitter and painful conflict that continued in the course of the following centuries."²³ In the eloquent words of a churchman who later contributed to elaborating this interpretation, "Galileo did not, for his part, have a personal 'Galileo affair.'"24

Note that this is not merely a denial of the traditional view claiming that the affair exemplifies the warfare between science and religion; the pope is instead claiming that the same episode really proves their harmony. The argument would be that Galileo did not believe that science and religion were in conflict but rather that they were in harmony, and he advanced plausible and eloquent reasons for such harmony. However, the conflict reappears when we contrast Galileo's view with that of his opponents and critics, who did believe that there was a conflict. Admittedly, the alleged contradiction is not between scientific and religious truths, which is a conceptual impossibility, given the standard meaning of the term "truth" and the term "contradiction," but the conflict would be between biblical statements and scientific propositions. In other words, contextually the conflict remains, and it is between those who affirm and those who deny that there is a conflict between physical inquiry and biblical statements.

This reemergence of the conflict is a good example of the kind of complication with which the history of the science–religion relationship abounds, and which has been well documented and eloquently discussed by John Brooke.²⁵

Another "complication" along the same lines is that, on the other hand, there is something quite right in the pope's interpretation of Galileo's view of the science–religion relationship. This is worth stressing, because there are scholars who persist in attributing to Galileo incoherences and absurdities on the topic which were not part of his thinking.²⁶

²⁴ George V. Coyne, "Conclusion," in Coyne et al., *The Galileo Affair: A Meeting of Faith and Science* (cit. n. 19), p. 178.

²⁵ Brooke, *Science and Religion* (cit. n. 1); and John Brooke and Geoffrey Cantor, *Reconstructing Nature* (cit. n. 1).

²⁶ The interpretation I am criticizing can be found in such works as the following: Brooke, *Science and Religion* (cit. n. 1), pp. 77–80; Arthur Koestler, *The Sleepwalkers: A History of Man's Changing Vision of the Universe* (New York: Macmillan, 1959); Jerome J. Langford, *Galileo, Science and the Church* (Ann Arbor: Univ. Michigan Press, 1966); Ernan McMullin, "Introduction: Galileo, Man of

²² Ibid.

²³ Ibid.

Galileo's key claim is a principle he attributes to Cardinal Cesare Baronio, who said, "[T]he intention of the Holy Spirit is to teach us how one goes to heaven and not how heaven goes."²⁷ This memorable formulation is the one directly applicable in the context in which Galileo makes this statement. The place is Galileo's "Letter to the Grand Duchess Christina" (1615), and the context is the criticism of the biblical objection; this objection argued that the earth must be standing still, because that is so stated or implied in the Bible. Baronio's principle directly invalidates the inferential soundness of this argument, or, in other words, it undermines the logical relevance of such a reason for such a conclusion.

The "Letter" also criticizes the truth of the objection's premise by questioning whether it is indeed true that the Bible states or implies that the earth is motionless. To this end, Galileo undertakes a careful analysis of a typical biblical passage adduced by the anti-Copernicans, namely the one describing the Joshua miracle.²⁸ Galileo argues plausibly that when literally interpreted, the passage is actually inconsistent with the geostatic view; on the other hand, from a geokinetic point of view, one can understand how the miracle could have happened as described; it follows that this biblical passage is more in accordance with the geokinetic than with the geostatic theory.

Given the specific critical purpose of Galileo's biblical exegesis here, his hermeneutical exercise, far from being incompatible with his rejection of the scientific authority of the Bible expressed by Baronio's principle, is complementary with his rejection. The two criticisms complement each other in the unproblematic ways in which one can always criticize a reason offered to support a conclusion: one can question the relevance of the reason; one can question the truth of the reason; or one can question both.

At any rate, returning to Baronio's principle, the "Letter to the Grand Duchess"

²⁷ Galilei, "Letter to the Grand Duchess Christina," in *The Galileo Affair*, ed. and trans. M. A.

Finocchiaro (cit. n. 7), p. 96. ²⁸ Josh. 10.12–13 asserts, "Then spake Joshua to the Lord in the day when the Lord delivered up the Amorites before the children of Israel, and he said in the sight of Israel, 'Sun, stand thou still upon Gibeon; and thou, Moon, is the valley of Ajalon.' And the sun stood still, and the moon stayed, until the people had avenged themselves upon their enemies." King James version.

Science," in Galileo, Man of Science, ed. idem (New York: Basic Books, 1967), pp. 3-51; idem, "Scientific Classics and Their Fates," in PSA 1994: Proceedings of the 1994 Biennial Meeting of the Philosophy of Science Association, ed. D. Hull, M. Forbes, and R. M. Burian, 2 vols. (East Lansing, Mich.: Philosophy of Science Association, 1995), vol. 2, pp. 266–74; and idem, "Galileo on Science and Scripture," in Machamer, The Cambridge Companion to Galileo (cit. n. 16), pp. 271-347. Of course, the views of all these authors do not coincide in every respect, but they do contain a common strand. For more details on the alternative interpretation advanced later in this essay, see Maurice A. Finocchiaro, "The Methodological Background to Galileo's Trial," in Reinterpreting Galileo, ed. William A. Wallace (Washington, D.C.: Catholic Univ. of America Press, 1986), pp. 241-72; and Finocchiaro, "Methodological Judgment and Critical Reasoning in Galileo's *Dialogue*," in D. Hull et Anocchiaro, Methodological Judgment and Critical Reasoning in Gameo's Dialogue, in D. Hur et al., *PSA 1994*, vol. 2, pp. 248–57; cf. Annibale Fantoli, *Galileo: For Copernicanism and for the Church*, 2nd ed., trans. George V. Coyne (Vatican City: Vatican Observatory Publications, 1996; distributed by Univ. of Notre Dame Press and in Italy and Vatican City by Libreria Editrice Vaticana); and Kenneth J. Howell, "Galileo and the History of Hermeneutics," in van der Meer, *Facets of Faith and Science*, (cit. n. 1), vol. 4, pp. 245–60. For other useful discussions, see William E. Carroll, "Galileo and the Interpretation of the Bible," *Science and Education* 8 (1999):151–87; Mauro Pesce, "L'Interpretazione della Bibbia nella lettera di Galileo a Cristina di Lorena e la sua ricezione," Annali *di Storia dell'Esegesi* 4 (1987):239–84; and idem, "Momenti della ricezione dell'ermeneutica bib-lica galileiana e della Lettera a Cristina nel XVII secolo," *Annali di Storia dell'Esegesi* 8 (1991): 55-104.

could not have just assumed its truth, and so one of Galileo's central purposes is to justify it. It is interesting and significant that Galileo attempts what might be called an orthodox justification, namely, one based on orthodox ideas.²⁹ These particular ones stem primarily from Saint Augustine. Galileo accepts Augustine's stress on "prudence." At the substantive level, the key premise of Galileo's argument is Augustine's traditional principle that if a biblical assertion contradicts a physical claim that has been conclusively proved, the latter is to be given priority and the biblical assertion set aside or reinterpreted. The crucial step in the argument is to ask for the rationale for this traditional practice: What is the reason why conclusively proved physical truths are (traditionally and uncontroversially) given precedence over conflicting biblical assertions? Baronio's principle gives the answer and provides the explanation. That is, Baronio's principle explains why Augustine's principle is correct, and this explanation in turn justifies the plausibility of Baronio's principle.

Next, once one accepts Baronio's principle, one can apply it to give an answer to another question, yielding an interesting and important corollary. What should one do when biblical assertions contradict physical claims that have not yet been conclusively proved but are capable of such a proof? The answer is that the scientist should be free to examine such claims and search for a proof. This corollary is implied by Baronio's principle and should be considered as well grounded as this principle is. If Galileo had been in possession of a conclusive proof of Copernicanism, then he would not have had to write this "Letter" or to answer criticism; he could have simply produced his proof, and the application of the traditional Augustinian principle would have easily and quickly resolved the problem. Thus the mere writing of the "Letter" is an indication that he felt Copernicanism was capable of conclusive proof, though not yet so proved. From this point of view, the *Dialogue on the Two Chief World Systems* (1632) may be described as aiming to establish that the earth's motion is susceptible of conclusive proof (as distinct from establishing that this phenomenon is indeed conclusively proved).

Finally, one may also ask what to do with regard to physical claims that, besides lacking a conclusive proof, are not even capable of being conclusively proved. For this class of propositions, Galileo sees no difficulty in accepting the Bible's word.

Thus, John Paul's interpretation of the Galileo affair is partly right, namely in regard to the Galilean view of how scientific inquiry and biblical interpretation can be seen to be harmonious. However, the conflict emerges at another level, namely in regard to exactly how and why they are harmonious. And this conflict not only existed in the historical context of three and one-half centuries ago but also does not seem to have disappeared in the contemporary situation. In fact, whatever John Paul's original intentions may have been in 1979–1980, the alleged rehabilitation never materialized, and the conclusion of the Vatican reexamination in 1992 was very disappointing.³⁰

²⁹ Galileo also advances the argument that God revealed Himself in two ways, through the Book of Nature as well as through Scripture; see Galileo, "Letter to the Grand Duchess Christina," in Finocchiaro, *Galileo Affair* (cit. n. 7), p. 93.

 ³⁰ E.g., see Michael Segre, "Light on the Galileo Case?" *Isis* 88 (1997):484–504; Antonio Beltrán Mari, "'Una Reflexión serena y objectiva': Galileo y el intento de autorrehabilitación de la Iglesia Católica," *Arbor* 160(629) (1998):69–108; Maurice A. Finocchiaro, "The Galileo Affair from John Milton to John Paul II: Problems and Prospects," *Sci. and Educ.* 8 (1999):189–209; and Hermes H. Benítez, "El Mito de la rehabilitación de Galileo," in idem, *Ensayos sobre ciencia y religión: De Giordano Bruno a Charles Darwin* (Santiago, Chile: Bravo y Allende, 1999), pp. 85–110.

IV. MORPURGO-TAGLIABUE'S HARMONY THESIS

A less well-known but more promising attempt at a harmony thesis is an interpretation which can be gleaned from the work of an Italian scholar named Guido Morpurgo-Tagliabue.³¹ To best appreciate this thesis, let us begin by calling attention to a change or development in Galileo's epistemological and methodological view of the nature of science. He certainly began with a version of the Aristotelian ideal of science as demonstration. This is relatively well known and uncontroversial, although recently new evidence and interesting nuances have been elaborated, largely due to the efforts of William Wallace.³² I also believe that by the end of his life, and certainly in the mature science of the Dialogue, Galileo held a fallibilist, probabilist, and hypothetical epistemology.³³ This later epistemology is still realist, so that in that regard I would say there was no change. Moreover, the later Galilean epistemology is nonexclusivist, in the sense that it does not claim that all scientific knowledge must be fallibilist; it is, rather, somewhat eclectic in allowing necessity and demonstration, if and when they are attainable, as is the case for the new science of motion sketched in the Two New Sciences (1638). But the crucial point is that revisable and merely probable hypotheses are not automatically denied scientific status.

In my opinion, this change in Galileo's epistemology is not only a historically real development that can be documented, but it is also a progressive development, a change for the better, as it were. Let us ask how and why Galileo's epistemology underwent this development. The answer lies, I believe, in the pressure from the Church. That is, the various conservative and reactionary elements which opposed, criticized, and even persecuted Galileo did in one sense happen to perform a valuable service, by making him see the light, as it were, in epistemological matters. It is not that these ecclesiastical elements themselves held a fallibilist epistemology and convinced Galileo of it; rather, they subscribed to the Aristotelian demonstrative ideal, but their criticism of Galileo's arguments helped him to understand that the Copernican hypothesis had still not been conclusively demonstrated; this perception suggested that the search for a conclusive demonstration is an essential stage of scientific investigation. I take this to be a version of the harmony thesis, because it is a case in which religion had a beneficial influence on science.

The main difficulty with this thesis is that it is a hypothesis that has not yet been

³¹ Guido Morpurgo-Tagliabue, *I Processi di Galileo e l'epistemologia* (Rome: Armando: 1991); and idem, "Sussiste ancora una questione galileiana?" *La Nuova Civiltà delle Macchine* (Rome) 3(1–2) (1985):91–9.

³² William A. Wallace, *Prelude to Galileo* (Dordrecht: Reidel, 1981); idem, *Galileo and His Sources* (cit. n. 12); idem, *Galileo's Logical Treatises* (Dordrecht: Kluwer, 1992); and idem, *Galileo's Logic of Discovery and Proof* (Dordrecht: Kluwer, 1992).

Logic of Discovery and Proof (Dordrecht: Kluwer, 1992). ³³ Maurice A. Finocchiaro, *Galileo and the Art of Reasoning* (Boston: Reidel [Kluwer], 1980); idem, "The Methodological Background to Galileo's Trial," in Wallace, *Reinterpreting Galileo* (cit. n. 26); idem, "Galileo's Copernicanism and the Acceptability of Guiding Assumptions," in *Scrutinizing Science: Empirical Studies of Scientific Change*, ed. Arthur Donovan, Larry Laudan, and Rachel Laudan (Baltimore: Johns Hopkins Univ. Press, 1992), pp. 49–67; idem, "To Save the Phenomena: Duhem on Galileo," *Rev. Int. Phil.* 46 (1992):291–310; idem, ed. and trans., *Galileo on the World Systems: A New Abridged Translation and Guide* (Berkeley and Los Angeles: Univ. of California Press, 1997); Owen Gingerich, "Hypothesis, Proof, and Censorship, or How Galileo Changed the Rules of Science," in *Galileo a Padova*, *1592–1610* (cit. n. 19), vol. 4, pp. 325–44; idem, "Copernican Revolution," in Ferngren et al., *The History of Science and Religion in the Western Tradition: An Encyclopedia* (cit. n. 1); and Joseph Pitt, *Galileo, Human Knowledge, and the Book of Nature* (Dordrecht: Kluwer, 1992). fully documented. However, I see no difficulties with its documentation. In any case, the present context is not one where such documentation is the main point of the discussion. I mention the thesis primarily as a promising version of the harmony thesis in regard to the Galileo affair.³⁴

V. FEYERABEND'S PROCLERICAL INTERPRETATION

Next I wish to discuss two other examples of complications all pointing in the same direction, that is toward the suggestion that the history of the relationship between science and religion is a very complicated business. Although they do relate to conflict and harmony, they are primarily examples of what might be called proclerical or apologetic³⁵ claims, as the harmony thesis itself tends to be.

The first example stems from Paul Feyerabend's interpretation of the Galileo affair, in his last essay on the subject.³⁶ This essay was a paper contributed to a conference which appears to have had an apologetic aim, in the sense that it was meant to substantiate and elaborate Pope John Paul's harmony thesis. Feyerabend did contribute a thesis that is in one sense proclerical but remains conflictual, and thus in another sense it is an anticlerical statement. (This, of course, is the kind of irony and iconoclasm of which Feyerabend was a master.)

Feyerabend portrays the affair as involving a conflict between two philosophical attitudes toward, and historical traditions about, the role of experts. That is, allegedly Galileo advocated the uncritical acceptance by society of the views of experts, whereas the Church advocated the evaluation by society of the views of experts in the light of human and social values; Feyerabend extracts the latter principle from Cardinal Bellarmine's letter to Foscarini dated 12 April 1615. Feyerabend concludes that "the Church would do well to revive the balance and graceful wisdom of Bellarmine, just as scientists constantly gain strength from the opinions of . . . their own pushy patron saint Galileo."37

Note that Feyerabend is advocating a conflictual interpretation, and thereby re-

³⁴ An analogous version of such a thesis, but at a more general level, may be gleaned from J. L. Heilbron, The Sun in the Church: Cathedrals as Solar Observatories (Cambridge, Mass.: Harvard Univ. Press, 1999). Although Heilbron's main purpose lies elsewhere, and although his intention is not an apologia for the Church, Heilbron does suggest that the lip service to the hypothetical status of Copernicanism required by the anti-Copernican decree of 1616 and by Galileo's condemnation of

1633 fostered an attitude of instrumentalism which was sound; see especially pp. 202–7. ³⁵ Here and throughout this essay, the labels "proclerical," "apologetic," and "pro-Galilean" are intended to have a descriptive, informative, and piecemeal connotation, rather than a loaded, in-flammatory, holistic, or name-calling meaning. Thus, note that I apply these terms to theses and not to persons, and that in my account authors often advance views that are a mixture of such orientations; moreover, "proclerical" and "pro-Galilean" are not meant to be opposites. E.g., note that although here I am describing Feyerabend's views as proclerical in one sense, four paragraphs later I point out the sense in which his account is anticlerical; that in the fifth paragraph of section VII, I point out how Viviani's interpretation is both proclerical and pro-Galilean; and that, whereas at the end of section II I discuss a thesis by Richard Blackwell which might be labeled anticlerical, in n. 38 I mention him as subscribing to another thesis which is proclerical. The noninvidious and nonloaded character of these terms may also be seen from the fact that I would have little difficulty describing as proclerical certain parts of this essay (e.g., my justification in section III of Pope John Paul II's interpretation of Galileo's views on science and Scripture) and pro-Galilean certain other parts (e.g., my account of the heresy versus disobedience issue in section VI). ³⁶ Paul K. Feyerabend, "Galileo and the Tyranny of Truth," in Coyne et al., *Galileo Affair*, pp. 155–66, reprinted in Paul K. Feyerabend, *Farewell to Reason* (London: Verso, 1987), pp. 247–64.

³⁷ Feyerabend, "Galileo and the Tyranny of Truth," in Coyne et al., Galileo Affair (cit. n. 19), p. 164.

jecting the harmony thesis. Rather than reversing the traditional type of interpretation, he reverses what may be called the traditional evaluation. In fact, he is siding with the Church and against Galileo, insofar as he thinks that the rule advocated by the Church was sounder than the one advanced by Galileo. At the same time, since the Church, in the meantime, has itself switched sides, the result is that Feyerabend is upholding the past Church against the present-day Church.

The difficulty with Feyerabend's account is that Galileo did not advocate the view attributed to him but, on the contrary, would have agreed with the one attributed to Bellarmine. Moreover, the evidence for attributing the view to Bellarmine is unclear and unconvincing. In any case, in this regard, their difference was not one of principle but of application; for example, they would have disagreed on who the relevant experts were, in particular whether theologians should be counted as experts in physics and astronomy; another disagreement would have been on whether the views of theological experts should be subject to the same requirement.

Although I believe Feyerabend's interpretation has some textual basis, it is ultimately untenable. But my main point here is that it provides a good illustration of how an intelligent reader can formulate an interesting thesis that is an updated and sophisticated version of the traditional, discredited, conflictual account.

VI. GALILEO AS A HERETIC?

The second proclerical thesis pertains to the disputed question of what Galileo was condemned for. Some scholars claim that Galileo was not condemned for heresy but for disobedience.³⁸ They argue that he was not condemned for heresy, because Copernicanism was never declared a formal heresy; he was condemned for disobedience, because in 1616 he had promised to obey the Church's order not to hold or defend Copernicanism, and with his *Dialogue* he broke that promise. Their view may be taken to lessen the seriousness of the censure imposed on Galileo, and so the depth of the conflict between him and the Church; it is thus an attempt to undermine or tone down the conflict thesis. It is also an apologetic or proclerical statement, since the Church is not charged with the error of having declared heretical a physical truth.³⁹ This, in turn, not only saves the doctrine of papal infallibility, which is of concern to Catholics, but upholds the Church's reputation to some degree in the eyes of non-Catholics. It will come as no surprise to us to learn, given this context, however, that the situation is more complicated.

It is true that Copernicanism was never officially declared a heresy. In 1616 the Inquisition consultants' report did indeed state that the heliocentric and heliostatic thesis was formally heretical (although it did not attribute the same degree of censure

³⁸ E.g., see Blackwell, "Could there be another Galileo case?" (cit. n. 16), p. 355; Walter Brandmueller, *Galilei e la Chiesa, ossia il diritto di errare* (Vatican City: Libreria Editrice Vaticana, 1992), pp. 144-46; Owen Gingerich, "Hypothesis, Proof, and Censorship, or How Galileo Changed the Rules of Science" (cit. n. 33), p. 342; and Pierre-Noel Mayaud, *La Condamnation des livres Coperniciens et sa révocation à la lumière de documents inedits des Congregations de l'Index et de l'Inquisition* (Rome: Editrice Pontificia Università Gregoriana, 1997), p. 313.

³⁹ The attribution of some such error is a recurring theme in the controversy about Galileo's trial; e.g., see Antoine Arnauld, "Difficultés proposées à M. Steyaert: IX Partie: XCIV Difficulté: Quinzieme exemple [La Condamnation des livres de Galilée]" (1692), in *Oeuvres de Messire Antoine Arnauld*, 49 vols. (Paris: Sigismond d'Arnay & Co., 1775–1783), vol. 9, pp. 307–14; and St. George Jackson Mivart, "Modern Catholics and Scientific Freedom," *Nineteenth Cent.* 18 (1885):30–47.

to the geokinetic thesis),⁴⁰ but, the Congregation of the Holy Office never made a formal declaration of this heresy. Instead, it was the Congregation of the Index that took some action; it issued a decree temporarily banning Copernicus's book until corrected, and the corrections were published in 1620. Nevertheless, in 1633, at the conclusion of the trial, Galileo was condemned for heresy, admittedly not the most serious form (called "formal heresy"), but an intermediate type, which was called "vehement suspicion of heresy" and was more serious than the lesser charge, "mild suspicion of heresy." Note especially that when the sentence explicitly states that Galileo has been found to be "vehemently suspected of heresy,"⁴¹ it is not merely saying that he was "suspected" of being a heretic and that the trial proceedings were unable to confirm or deny the suspicion; rather it is convicting him of a specific category of religious crime.⁴²

Moreover, the sentence goes on to explain what the heresy was and claims it to have been twofold: the first part is a physical claim, the key Copernican thesis of heliocentrism and geokineticism; the second part is the methodological principle that "one may hold and defend as probable an opinion after it has been declared and defined contrary to Holy Scripture."⁴³ This prescription is basically a way of stating Baronio's principle, for the two principles basically imply each other. For if we start by agreeing with Baronio, then the purpose of the Bible is not to teach astronomical propositions, and so the Church has no business passing judgment on such propositions, and in astronomical inquiry it becomes permissible to disregard such biblical statements and ecclesiastical judgments. Conversely, if we start with the above-quoted principle, it should be noted at the outset that the opinion in question is an astronomical opinion even if the Church has declared it contrary to the Bible; this can only be if such ecclesiastic declarations are irrelevant; and this in turn can only happen if the purpose of the Bible is not to teach astronomical knowledge.

By formulating Galileo's alleged heresies in this manner, the sentence is convicting him of nonexistent crimes, so to speak; it gives the impression that the Copernican opinion and Baronio's principle had been officially declared heresies. As stated earlier, this impression is false for the case of the Copernican opinion; it is also false and even more unfounded for Baronio's principle, which, however controversial it may have been at the time, was never the subject of an official inquiry or decree. What is happening is what may be called an abuse of power, of a type seldom discussed in this context: it is this abuse of power that enabled the Inquisition to condemn Galileo as a heretic, even though his beliefs had never officially been condemned as heretical.⁴⁴

⁴⁰ Finocchiaro, *The Galileo Affair* (cit. n. 7), p. 146.

⁴¹ Ibid., p. 291.

⁴² Ibid., p. 38; cf. Finocchiaro, "The Methodological Background to Galileo's Trial" (cit. n. 26); Léon Garzend, *L'Inquisition et l'hérésie* (Paris: Desclée de Bouwer, 1913); Orio Giacchi, "Considerazioni giuridiche sui due processi contro Galileo," in *Nel Terzo centenario della morte di Galileo Galilei*, ed. Università Cattolica del Sacro Cuore (Milan: Vita e Pensiero, 1942), pp. 383–406; and Eliseo Masini, *Sacro arsenale overo Prattica dell'officio della Santa Inquisizione* (Genoa: Appresso Giuseppe Pavoni, 1621).

⁴³ Finocchiaro, The Galileo Affair (cit. n. 7), p. 291.

⁴⁴ One author who deserves the credit of having discussed this abuse of power is Fantoli, *Galileo: For Copernicanism and for the Church* (cit. n. 26), pp. 446–56. On the other hand, it could be objected to my interpretation that the charge against Galileo is that he violated the rule that once a

In regard to Galileo's alleged disobedience, the sentence certainly includes talk about such a transgression. And it is also true that as a result of the plea bargaining after the first deposition, Galileo pleaded guilty of having disobeyed the order not to hold or defend the geokinetic thesis. Several clarifications are in order here.

First, it should be mentioned that the disobedience did not pertain to the mere discussion of the topic. The Inquisitors did not press that charge after Galileo produced Bellarmine's certificate and in the light of the fact that the Special Injunction document lacked Galileo's signature; nor did Galileo admit having been ordered not to discuss the topic. Second, in regard to holding and defending Copernicanism, Galileo denied (even under the verbal threat of torture) having done so intentionally or deliberately.

The final clarification regards the fact that, just because the Inquisition found him guilty of having held and defended the earth's motion, and just because he admitted having done so, these assertions do not make it so. I am not sure the Inquisitors ever proved that the *Dialogue on the Two Chief World Systems* holds and defends Copernicanism. To begin with, we must clearly distinguish the notion of *holding* a view from the notion of *defending* it. This distinction is relatively uncontroversial, and the Inquisition consultants who wrote reports on the *Dialogue* made the distinction.⁴⁵ But what this means is that the evidence proving that Galileo *defended* Copernicanism cannot be the same as the evidence proving that he *held* that view.

In order to prove the case about Galileo's having *held* the earth's motion, one would have to prove that he regarded his arguments as conclusive.⁴⁶ For, as distinct from defending a view, to hold it suggests belief and commitment, and a sufficient degree of belief and commitment that one is not going to abandon it lightly. I realize, of course, that this is both a long story and a controversial one. Let me mention just one point,⁴⁷ because it is usually neglected: namely, the fact that it is clear that Galileo gives several arguments in favor of the earth's motion; this multiplicity is, I

⁴⁵ Finocchiaro, Galileo Affair (cit. n. 7), pp. 262–76.

⁴⁶ Again, note that here I am talking about the notion of *holding* a view, and not about the notion of *defending*; I discuss the latter in the next paragraph.

⁴⁷ For more details about my view and a discussion of alternative interpretations, see Finocchiaro, *Galileo on the World Systems* (cit. n. 33), especially pp. 52–8.

doctrine has been officially declared contrary to Scripture, it is impermissible to defend it publicly; that he was guilty of this charge because Copernicanism had been officially declared contrary to Scripture (presumably by the Index decree of 1616) and in his *Dialogue* he had defended it publicly; and that his conviction for "vehement suspicion of heresy" amounts to his being found guilty of this charge. This objection embodies an interesting and important interpretation of Galileo's condemnation which may be traced as far back as Giovanni Battista Riccioli (Almagestum novum, 2 vols. [Bologna, 1651], vol. 2, pp. 290, 495-6), and which continues to impress some present-day scholars; it deserves more extended discussion, but here I can only briefly summarize my answer. First, this is more of a vindication than an interpretation of the sentence, because it does not reflect the precise wording of the sentence, which speaks of a twofold heresy and of a denial rather than of a violation of the principle mentioned here. In regard to the substance of the objection, I begin by questioning the legal and intellectual status of the rule that it is impermissible to defend publicly a doctrine officially declared contrary to Scripture, especially for the case of astronomical doctrines; as we have seen, this is a rule which many Catholics might have wanted to follow but which did not have the force of a law whose violation would be a crime-in short, it was not a law. I also question the status and applicability of the Decree of Index, which did say that Copernicanism contradicted Scripture but which cannot be equated with a decree of the pope speaking ex cathedra or of a general sacred council. At this point one could mention the warning or special injunction to Galileo personally, which raises the question of disobedience, to which my discussion in the text now turns.

believe, an indication that he did not regard any one of them as conclusive, not even the argument from tides. Thus, it is not obvious that in the *Dialogue* Galileo *holds* the opinion of the earth's motion.

To prove that he was guilty of *defending* that opinion, one would have to overcome the following problem. The *Dialogue* discusses all the scientific and philosophical arguments on both sides of the controversy. His discussion takes the form not only of presenting and analyzing the arguments, but also of evaluating them. Now, his evaluation is indeed basically unfavorable and negative for the anti-Copernican arguments, and favorable and positive to various degrees for the pro-Copernican arguments. If his evaluations are correct, is the discussion really a defense? Isn't he merely articulating the thesis that the pro-Copernican arguments are stronger than the anti-Copernican ones? Is it his fault if the arguments on one side are stronger than those on the other side?

The consultants' reports submitted in April 1633 do contain discussions of such issues, but their case for guilt on this score is far from conclusive or convincing. The case is certainly not proved beyond a reasonable doubt, and I do not think it is proved even by a preponderance of the evidence, to use present-day jargon. At any rate, these issues were never aired at the trial. My conclusion is that even Galileo's alleged disobedience is questionable.

VII. TOWARD A HISTORIOGRAPHY OF THE GALILEO AFFAIR

What is the upshot of these reflections? Does anything more interesting or substantial follow than that the trial of Galileo, like the history of the relationship between science and religion, is a complicated business? Ultimately it may turn out that, as I suggested earlier, underlying the apparent conflict between science and religion the trial of Galileo exhibits the deep structure of nothing less, and nothing more, than the conflict between conservation and innovation. However, before we resort to such a minimalist thesis, I believe we would need to study the controversy about Galileo's trial more seriously than simply to find instances of conflict or harmony.

We may very well discover that the subsequent controversy (1633–1992), although it obviously began with the condemnation of Galileo and reflects the issues of the original controversy (1613–1633), acquired a life of its own and possesses a fascination rivaling that of the original. In short, the historiography of the Galileo affair is itself a complex phenomenon and development of Western cultural history of the last three and one-half centuries. It may even be that, underlying the diversity of opinion on the trial of Galileo, it is the subsequent controversy which possesses the characteristics of a conflict between science and religion. But even if such an elegant possibility is not the case, the historiography of the Galileo affair is likely to prove methodologically instructive.⁴⁸

However, before such a deep structure is demonstrated, the variety and complexity of historical interpretation should be exhibited. The following examples are offered as being both intrinsically interesting and illustrative of such richness.

An interesting example of the historiographical lessons that can be learned from

⁴⁸ Brooke and Cantor seem to advance such a suggestion in their own analysis of "the contemporary relevance of the Galileo affair." See their *Reconstructing Nature* (cit. n. 1), pp. 106–38, especially pp. 106, 130, and 132.

the history of interpretations is provided by Vincenzio Viviani.⁴⁹ In 1654 he made the first serious attempt to write a biography of Galileo, and in the process he formulated an interpretation of the affair. His account is significant for several reasons: he had lived with Galileo during the last few years of his life; he had unparalleled access to the documents; and, although it was not published until 1717, his was the

first biography of Galileo.50 Here I want to focus on the fact that Viviani's interpretation of the affair suggests a historiographical category that I will label "mythological." His interpretation attempts to be both pro-Galilean and proclerical, but it is hardly judicious; in fact, it strikes me as outrageous. This is what Viviani says:

For his other admirable speculations Mr. Galileo had been raised to heaven with immortal fame, and for his many discoveries he had been regarded by men as a god; thus, the Eternal Providence allowed him to prove himself human by letting him commit an error when, in discussing the two systems, he showed himself more inclined to believe the Copernican hypothesis, which had been condemned by the Church as incompatible with Divine Scripture. Because of this, after the publication of his Dialogue Mr. Galileo was called to Rome by the Congregation of the Holy Office. Having arrived there around February 10, 1633, through the great generosity of that Tribunal and of the Sovereign Pontiff Urban VIII (who already knew him as highly meritorious in the republic of letters), he was kept under arrest at the residence of the Tuscan ambassador in the delightful palace of Trinità dei Monti. Having been shown his error, he quickly retracted this opinion like a true Catholic. As a punishment his *Dialogue* was banned. After this five-month detention in Rome (while the city of Florence was infected with the plague), he was generously assigned for house arrest the residence of Monsignor Archbishop Piccolomini, who was the dearest and most esteemed friend he had in the city of Siena. He enjoyed the latter's highly cordial conversation with so much ease and emotional satisfaction that he resumed his studies and discovered and demonstrated most of his mechanical conclusions on the resistance of solids, among other speculations. After about five months, when the plague in his homeland had completely ceased, at the beginning of December 1633 His Holiness commuted his house arrest from the restriction of that residence to the freedom of country living, which he so much enjoyed. So he returned to his villa in Arcetri, where he had been living already most of the time on account of the healthy air and the great accessibility to the city of Florence, and where consequently he could easily receive visits by friends and relatives, which always brought him great comfort and consolation.⁵¹

Another instructive interpretation is the one advanced by Thomas Salusbury in 1661 in the preface to his Mathematical Collections and Translations. The first part of the first tome of this work contains the first published English translation of Galileo's Dialogue. Salusbury judges Galileo's masterpiece to be a "singular and unimitable [inimitable] piece of reason and demonstration"⁵² and to "have been with all

⁵¹ Ibid., p. 617; the translation is my own.

⁵² Thomas Salusbury, ed. and trans., Mathematical Collections and Translations, 2 vols. (London, 1661), tome 1, pt. 1, editorial preface to Galileo's *Dialogue*.

⁴⁹ Brooke and Cantor do discuss Viviani, but they focus on his general interpretation of Galileo's science and methodology and do not mention at all Viviani's interpretation of the affair; see ibid., pp. 123-6. Although my focus here is different, I agree with their critique, as may also be seen from Mario Biagioli, *Galileo Courtier: The Practice of Science in the Culture of Absolutism* (Chicago: Univ. of Chicago Press, 1991), pp. 87–8; Michael Segre, "Viviani's Life of Galileo," *Isis* 80 (1989):207–32; and idem, *In the Wake of Galileo* (New Brunswick, N.J.: Rutgers Univ. Press, 1991). ⁵⁰ See Galilei, *Opere*, ed. Favaro (cit. n. 11), vol. 19, pp. 599–632.

the veneration valued, read and applauded by the judicious."⁵³ However, he does not want to hide the fact that Galileo's work was not equally well received in other quarters, that in particular, as Salusbury expresses it, the book was "with much detestation persecuted, suppressed and exploded by the superstitious."⁵⁴ Thus he feels obliged to offer the following explanation to the reader:

I am to tell him that our Author having assigned his intimate Friends *Salviati* and *Sagredo* the more successfull Parts of the Challenger, and Moderater, he made the famous Commentator *Simplicius* to parsonate the Peripatetick. The Book coming out, and *Pope Urban* the *VIII*. taking his Honour to be concern'd as having in his private Capacity bin very positive in declaiming against the Samian Philosophy, and now (as he supposed) being ill delt with by Galileo who had summed up all his Arguments, and put them into the mouth of *Simplicius*; his Holiness thereupon conceived an implacable Displeasure against our Author, and thinking no other revenge sufficient, he employed his Apostolical Authority, and deals [sic] with the Consistory to condemn him and proscribe his Book as Heretical; prostituting the Censure of the Church to his private revenge.⁵⁵

How are we to classify, reconstruct, and evaluate Salusbury's interpretation? It seems to explain Galileo's condemnation in terms of a private psychological cause, the pope's displeasure at being impersonated in the dialogue by the character Simplicio and his consequent desire for revenge; thus we could label it a psychological interpretation.

Salusbury also emphasizes a rhetorical miscalculation in the *Dialogue*, however. There is certainly some truth to the claim that the pope was rather offended by certain aspects of the *Dialogue*. However, it is unlikely that he attached too much importance to that feeling, because he had much more important things to worry about. For example, the charge that the book was a clear violation of the special injunction of 1616 represented a serious administrative problem, and the politics of the Thirty Years' War had the pope facing the threat of impeachment by the College of Cardinals. Still, if and to the extent that the pope's offense and anger were real, the book must be regarded as a gross rhetorical miscalculation on Galileo's part, for clearly he did not intend to offend or anger the pope. Thus, at a deeper level, Salusbury's interpretation attributes the condemnation to a key rhetorical flaw of the book.

My final example consists of William Whewell's writings on the Galileo affair. Given Whewell's general importance in the history of the history and philosophy of science and his keen interest in the relationship between science and religion, the potential rewards of such a study are very great.

A clue to the complexity of Whewell's case is provided by the location and chronology of his writings on the subject. There is first of all an essay entitled "The Copernican System Opposed on Theological Grounds," which exists in three different versions, corresponding to the three editions of his *History of the Inductive Sciences* (1837, 1847, 1857).⁵⁶ Then there is a piece entitled "Case of Galileo" in the

⁵³ Ibid.

⁵⁴ Ibid.

⁵⁵ Ibid. The archaic spelling and punctuation are, of course, Salusbury's own and have been left unchanged.

⁵⁶ E.g., see William Whewell, "The Copernican System Opposed on Theological Grounds" (bk. V, chap. III, sec. 4), both in the first edition of his *History of the Inductive Sciences*, 3 vols. (London: John W. Parker, 1837), vol. 1, pp. 397–404, and in the third edition, 3 vols. (London: John W. Parker and Son, 1857), vol. 1, pp. 303–12.

Philosophy of the Inductive Sciences (1847), which is a response to some criticism of the first-edition account.⁵⁷ Finally, there is something entitled "Were the Papal Edicts against the Copernican System Repealed?" (1857), which was added to the third edition of the *History*.⁵⁸

Whewell's sketch of the events of the affair reads like an uncritical summary of the Inquisition sentence, which had always been well publicized and contained a version of the events from 1613 to 1633. However, whatever limitations Whewell's views may contain, we cannot be blind to the fact that they are interesting and challenging. For example, in the first edition of the *History* he explains Galileo's troubles as stemming mostly from an important characteristic peculiar to the Italian Catholic Church: "[I]n Italy the Church entertained the persuasion that her authority could not be upheld at all, without maintaining it to be supreme on all points."59 Using present-day concepts, we might equate this characteristic with totalitarianism, as distinct from authoritarianism. But later Whewell stresses an explanation in terms of what he calls "decorum," advanced in the context of interpreting the legendary "E pur si muove": "[T]his is sometimes represented as the heroic soliloquy of a mind cherishing its conviction of the truth, in spite of persecution; I think we may more naturally conceive it uttered as a playful epigram in the ear of a cardinal's secretary, with a full knowledge that it would be immediately repeated to his master."60

VIII. EPILOGUE

In summary, the history of Galileo's trial (1613–1633) and the historiography of the Galileo affair (1633–1992) suggest several lessons. One of the most obvious and general of these is that in studying the trial historians bring to their subject general assumptions about the relationship between science and religion. We have seen that when we examine the views of such authors as Draper, White, Drake, Feyerabend, Morpurgo-Tagliabue, Viviani, and Whewell it is not hard to discern the pattern.

A more specific and controversial lesson regards the assumption that science and religion are incompatible. Some historians do try to interpret Galileo's trial in the light of this conflict, but we have seen that this interpretation is untenable. However, my discussion suggests that the root difficulty of such an interpretation is that it is formulated in an oversimplified manner, for other conflictual interpretations are similarly untenable when simplistically formulated; we have seen that this is the case for the alleged conflict between science and philosophy, and even for that between Jesuits and Dominicans. Moreover, the oversimplified version of the harmony interpretation is also untenable. On the other hand, sophisticated versions of both

⁵⁷ William Whewell, "Case of Galileo" (bk. X, chap. IV, art. 13), in his *Philosophy of the Inductive Sciences Founded upon their History*, 2nd ed. 2 vols. (London: John W. Parker, 1847), vol. 1, pp. 696–700. The criticism had appeared in Peter Cooper, "Galileo—The Roman Inquisition," *Dub lin Review* 5(9) (July 1838):72–116.

⁵⁸ William Whewell, "Were the Papal Edicts against the Copernican System repealed?", in his *History of the Inductive Sciences*, 3rd ed. (1857) (cit. n. 56), vol. 1, pp. 393–4. ⁵⁹ Whewell, *History of the Inductive Sciences*, 1st ed. (1837) (cit. n. 54), vol. 1, p. 399. Although

⁵⁹ Whewell, *History of the Inductive Sciences*, 1st ed. (1837) (cit. n. 54), vol. 1, p. 399. Although Whewell does not mention Riccioli, Whewell's claim can be traced to Riccioli's *Almagestum novum* (cit. n. 44, vol. 2, p. 290), where it is asserted that the authority of the Bible must be upheld in astronomy, because otherwise the faithful would start questioning its authority in the domain of faith and morals.

⁶⁰ Whewell, *Philosophy of the Inductive Sciences*, 2nd ed. (1847) (cit. n. 57), vol. 1, p. 699.

harmonious and conflictual interpretations involving science and religions remain viable. Thus the lesson here appears to be the undesirability of oversimplification.

This plea for sophistication and against oversimplification, if it is to stand, must identify relevant criteria. To begin with, such criteria must not be regarded as mechanical rules guaranteed to ensure correctness; they ought to be conceived as general guidelines that should always be kept in mind but that can bring good results only if supported by concrete historical investigation. Having said this, the other guidelines I offer are the points mentioned in the first paragraph of this essay. Thus, secondly, one should avoid hasty generalizations, or concluding that the conflict (or the harmony) that has been found to be true in some cases is true of all. Third, one must be mindful of the fact that what is meant by science or religion in different historical periods and cases may differ. Fourthly, there are other kinds of relationships between science and religion besides conflict and harmony: for example, separation, dialogue, integration, and subordination. Fifthly, each of these relationships is itself multifaceted; conflict can take the form of either open warfare or peaceful competition; harmony can involve influence by science on religion and also by religion on science. Sixthly, influence can manifest itself is several ways: presupposition, sanction, motive, prescription, or substantive source. Finally, "science" can refer to various contexts, such as discovery, justification, and popularization; and "religion" can refer to theology, metaphysics, worldview, myth, ritual, or ecclesiastical institutions.

Another less obvious lesson is that the historiography of the Galileo affair (1633-1992) may be relevant to the question of the interaction of science and religion in another way. To see this, we need to consider the historiography of the affair in the context of the controversy about the original trial that has been a recurring theme in the Western cultural history of the last three hundred fifty years; we need to distinguish sharply between two controversies: the original one, which climaxed with Galileo's condemnation in 1633, and the subsequent one, which began then and continues down to our own day. Although it is probably not the case that the trial exemplifies the conflict between science and religion,⁶¹ the subsequent controversy may very well do that, since the latter is defined primarily by the way the original trial was perceived, and the traditional and most common perception (whether correct or incorrect) has been one of a conflict between science and religion. To undermine the perception of such a conflict (in the historiography of the affair), it is not enough to criticize the factual correctness of the corresponding interpretations. I believe the most promising way is not to deny or explain away the conflict, but to regard it as the surface manifestation of something deeper. Nor do I think that that deeper structure is the same one underlying the original controversy, namely the dialectic between conservation and innovation. That deeper structure lies, I would suggest, in the phenomenon of the origin, diffusion, and development of cultural myths.

⁶¹ In the sense that the "science–religion" conflict is the most important aspect of the trial. But such a conflict might have to be allowed as a first approximation—a simplification, so to speak—in a context in which one distinguishes simplification from oversimplification—an eighth guideline to be added to those mentioned in the preceding paragraph.