Giordano Bruno and the History of Science

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(ABSTRACT)

Historians of science express widely divergent interpretations of the significance of the Italian philosopher Giordano Bruno (1548-1600) to the history of science. An examination of the history of science reveals two basic schools of thought about Bruno. Specifically, historians of science disagree on the reason for Bruno's execution at the hands of the Roman Inquisition in 1600. One school of thought, the "martyr to science" interpretation, insists that Bruno died as the direct result of his advocacy of Copernicanism. The opposing school rejects this assessment and names a variety of unorthodox religious beliefs as the motivation for Bruno's execution.

These two positions, the "martyr to science" and the "anti-martyr to science" schools of thought, form the basis of two parallel interpretive schemes about early modern science that have coexisted in the history of science for nearly 150 years. In particular, the "martyr to science" school tends to view religion as innately hostile to science. Moreover, this school also emphasizes the discontinuities between medieval and modern science. In contrast, the "anti-martyr to science" school often rejects the existence of an inherent conflict

between science and religion. The "anti-martyr to science" school also tends to highlight the continuities between medieval and modern science.

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Table of Contents

Chapter One: Giordano Bruno in the History of Science

Introduction

Interpretation plays a critical role in the construction of historical accounts. Historians choose facts, and then structure those facts into accounts, on the basis of fundamental assumptions about the nature of the world. A specific example, that of Giordano Bruno's place in the history of science, aptly demonstrates the role of interpretation in the creation of historical accounts. In particular, views of the reasons for Bruno's death form, as this work will show, an integral part of wider interpretations of the development of modern science.

This thesis will examine the characterizations and uses of Bruno in broad interpretive studies of the history of science, including both popular and scholarly works, since the emergence of the martyr to science view in the mid-nineteenth

century.[1] Because Bruno is the focus of attention, only works that cover the period at least until 1600 qualify for inclusion in this thesis. Bruno deserves such attention for several reasons. First, except for Galileo, no other figure receives as much coverage as an alleged victim of the early modern Church's supposedly anti-scientific posture.[2] Second, the diversity of opinion on the significance of Bruno to the creation of modern science also points to his usefulness as a subject of study. Whatever the final judgment, if one is possible, in the confrontation between Galileo and the Church, no one has ever disputed his importance to the development of modern science. Bruno, on the other hand, has a long history of controversy over his status.[3] The fact that evaluations of Bruno's significance vary in such an unusual manner provides the perfect entry point for a study of the historiography of science. Finally, and perhaps most fundamentally, no work on the historiography of Bruno's place in the history of science exists.[4] My object in this thesis is not to judge the validity of the interpretations that the works offer. At all times, the focus will be on the existence, structure, and function of interpretive patterns in the history of science.

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1 Frances Yates, *Giordano Bruno and the Hermetic Tradition*, (New York: Vintage Books, 1964), 450; Paul Henri Michel, *The Cosmology of Giordano Bruno*, trans. R. E. W. Maddison, (Ithaca, New York: Cornell Univ. Press, 1973), 10-11.

2 Another alleged martyr to science, Michael Servetus (1511-1543), receives too little attention to serve as a meaningful comparison with Bruno.

3 Antoinette Mann Paterson, *The Infinite Worlds of Giordano Bruno*, (Springfield, Ill.: Thomas, 1970), 3-4. Michel, 9-11.

4 Yates, 451; Francis Yates, in *Giordano Bruno and the Hermetic Tradition* calls for an examination of the historical development of Bruno's image. This thesis represents an attempt at such a survey within the confines of the history of science.

The Alioto Question

For the purposes of this study, a short sketch of Bruno's life will suffice. A contentious and controversial figure, Giordano Bruno was born in Nola, in southern Italy, in 1548. The Roman Inquisition supplied the other terminal point of his life by burning him at the stake in Rome in 1600. During the half-century in between, Bruno continually provoked controversy with his out-spoken iconoclasm. Forced to leave the Dominican Order because of his unorthodox opinions, Bruno wandered across Europe expounding a radical critique of established ideas on nature, society, and religion. He had little regard for the opinions of others and viciously attacked his critics' positions; he also had little regard for the threat that such vociferous attacks posed to his personal safety. Finally, in 1592, the Inquisition seized Bruno while he was in Venice. After extradition to Rome, he spent eight years in prison until his execution on February 17, 1600.[5]

How such a cantankerous individual became the center piece of this work requires a bit of explanation. A short passage in Anthony Alioto's textbook, *A History of Western Science*, describes Bruno's philosophy. After a discussion of

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[5] Frances Yates, "Giordano Bruno", *Dictionary of Scientific Biography*, (Charles Coulston Gillispie, ed., New York: Charles Scribner's Sons, 1970), 2: 539-544. The literature on Bruno's life is extensive. Among the more important biographies are Christian Bartholmess, *Jordano Bruno*, 2 vols., (Paris: Librarie Philsophique De Ladrange, 1847). Domenico Berti, *La Vita di Giordano Bruno*, (Florence: 1867). I. Frith, *Life of Giordano Bruno*, Rev. by Moriz Carriere, (Boston: Ticknor and Co., 1887). J. Lewis McIntyre, *Giordano Bruno*, (New York: The Macmillan Company, 1903). William Boulting, *Giordano Bruno: His Life, Thought, and Martyrdom*, (1914; rprt. Freeport N.Y.: Books for Libraries Press, 1972). V. Spampanato, *Vita di Giordano Bruno* , (Messina: Casa Editrice G. Principato, 1921). Dorothea Waley Singer, *Giordano Bruno: His Life and Thought*, (New York: Henry Schumann, 1950). Frances Yates, *Giordano Bruno and the Hermetic Tradition*, (New York: Vintage Books, 1964).

Bruno's interpretation of Copernicanism, Alioto dismisses Bruno's philosophy as irrelevant to the development of modern science.[6] Specifically, Alioto argues that

> Bruno appears to be more of a heretical pantheist than a champion of the new astronomy. It is no wonder, then, that he was tried in Rome by the Inquisition and burned at the stake in 1600. His was a religious revolution, and he was not burned because of his astronomy. Strictly speaking, he was not even a Copernican![7]

The coverage and subsequent negative evaluation of the role of Bruno's philosophy in the Scientific Revolution seem at odds with the purpose of Alioto's book. A textbook is generally a concise catalog of accepted facts and interpretations that presents only the data that is relevant to the subject at hand. Yet, Alioto's treatment of Bruno violates this principle of economy. By examining Bruno's philosophy and then rejecting it as unimportant to the discussion, Alioto thus raises the puzzling question of the purpose behind his inclusion of Bruno in a textbook.[8]

An investigation into the relationship between Alioto's book and the rest of the literature on the history of science offers an answer to the mystery of Alioto's incongruous treatment of Bruno. Even a brief perusal of the secondary literature indicates that Alioto's coverage of Bruno is not an isolated event. Bruno appears in virtually every historical work that examines the emergence of modern science. Equally evident is the vast array of opinions about him. No

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[6] Anthony M. Alioto, *A History of Western Science*, (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1987), 183-184.

[7] Ibid., 184.

[8] Alioto's treatment of Bruno, though serving as the inspiration for this project, differs in character from the works that will be considered. Specifically, Alioto's textbook consciously strives to refute the notion that Bruno died for his science. By addressing Bruno's status so forcefully, Alioto effectively excludes Bruno as a legitimate figure in the history of science. While some of the works that will be examined also reject Bruno as a scientific thinker, such works nevertheless attempt to integrate Bruno into the history of science in some manner. See Alioto, 183-184.

consensus exists concerning Bruno's significance to the Scientific Revolution.[9] Knowledge of this state of affairs in the history of science renders Alioto's otherwise puzzling passage comprehensible. Although Alioto himself considers Bruno unimportant to the development of modern science, the combination of a lack of consensus and Bruno's ubiquitous presence demands that Alioto address the issue of Bruno's significance in some manner. In effect, his assertions about Bruno act as a disclaimer against the welter of competing claims regarding Bruno's place in the history of science.[10]

An examination of the secondary literature, however, solves the Alioto "question" at the expense of creating the Bruno "question." At issue is the very thing that illuminates the mystery of Alioto's inclusion of Bruno in a textbook: the omnipresence of Bruno and the conflicting interpretations of his significance to the development of modern science. Viewing the passage in *A History of Western Science* as a self-conscious response to a vast and contentious body of literature thus opens the door to an examination of the history of science as a whole. Specifically, such an examination centers on the mismatch between the widespread coverage of Bruno and the lack of consensus about his place in the Scientific Revolution. The odd thing here is the fact that even works that don't consider him important to the development of modern science often go to considerable lengths to make sense of Bruno's ideas in the context of the early

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[9] Among others, the following note the debate over Bruno's significance to science: Hugh Kearney, *Science and Change 1500-1700*, (New York: The McGraw-Hill Book Comp., 1971), 108; Edward A. Gosselin and Lawrence S. Lerner, ed. and trans., *The Ash Wednesday Supper: La Cena de la Cenari*, by Giordano Bruno, (Hamden Conn.: Archon, 1977), 13; William P. D. Wightman, *Science and the Renaissance*, 2 Vols., (New York: Hafner Pub. Co., 1962), 43, also note the lack of consensus.

[10] Alioto, 183-184.

modern period. Such efforts, at first glance, are difficult to explain. If Bruno is not important to the rise of modern science, then he does not belong in a history of science. Yet, Bruno frequently appears in histories of science only to be quickly dismissed as, ultimately, unimportant to science.[11]

In retrospect, the secondary literature reveals that Alioto's passage also hints at another major feature of the Bruno "question." With no obvious justification, Alioto explicitly includes a discussion of the reasons for Bruno's death.[12] A comparison of Alioto's work with the rest of the literature shows that his inclusion of Bruno's death performs the same "disclaimer" function as did the discussion of Bruno's significance. As was the case with the debate over his significance, discussions of Bruno's death figure prominently in the history of science. Only a handful of works neglect to mention Bruno's trial and execution by the Roman Inquisition. Moreover, the stated reasons for Bruno's execution vary as widely as the judgments on his significance. These parallels, in function, diversity, and quantity, between discussions of Bruno's death and his significance are striking. Assuming that mere morbid interest is not the motivation for dwelling on his execution, the similarity of the evaluations of both Bruno's death and his significance suggests a connection between interpretations of Bruno's significance to science and interpretations of the reasons for his execution.[13]

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[11] Probably the best example of this ambivalent attitude towards Bruno appears in James Jeans, *The Growth of Physical Science*, (New York: The Macmillan Co., 1948), 140.

[12] Ibid., 184.

[13] See for example, Kearney, 108, 148; Woodbridge Riley, *From Myth to Reason*, (London: D. Appleton and Co., 1926), 124, 126, 135.

The lack of data on the reason for Bruno's execution further strengthens the case for a correlation between his significance and the manner of his death. According to Frances Yates, French troops, in the early nineteenth century, destroyed the official Church documents that recorded the charges against Bruno. Other sources on Bruno's trial and execution do not state the exact charges against him.[14] In the absence of a document that charges Bruno with a specific crime, historians must interpret the circumstances of his death from vague clues in the surviving documents.[15] The meanings that historians of science attach to the clues naturally derive from the historians' fundamental assumptions about the history of science. Not surprisingly, evaluations of the reasons for Bruno's death vary considerably from writer to writer.[16] If the hypothesized correlation between Bruno's significance and the reasons for his execution holds up, then evaluations of his significance in the history of science should vary in the same manner and match with the judgments on the reasons for his death.[17] Determining the existence of a correlation between evaluations of Bruno's significance to science and the manner of his death would then fulfill two purposes. First, it would offer an explanation, as the preceding argument has demonstrated, for the strange inconsistency between the degree of coverage and

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[14] Yates, *Hermetic Tradition*, 349; Frith, 290. Yates, in *Hermetic Tradition*, cites Angelo Mercati's *Il Sommario del Processo di Giordano Bruno*, (Citta' del Vaticano: Biblioteca Apostolica Vaticana, 1942), 1-4, as evidence that the documentation on Bruno's death no longer exists. Yates made this remark in 1962; however, Frith made the same comment in 1887 (290).

[15] Yates, 354-355.

[16] Compare, for example, Joseph Mayer, *The Seven Seals of Science*, (New York: The Century Co., 1927), 7, with Allen G. Debus, *Man and Nature in the Renaissance*, (New York: Cambridge Univ. Press, 1978), 87.

[17] Examples include Kearney, 108, 148; Riley, 124, 126, 135.

the degree of consensus about Bruno. Second, a correlation between interpretations of Bruno's significance and his death might also reveal a number of basic assumptions about the history of science.

Bruno's Function in the History of Science

The possibility of a correlation between interpretations of Bruno's significance and his death provides the key to the Bruno "question". Although either the views on Bruno's execution or the views on his death could serve as the starting point for an investigation of the Bruno "question" two factors favor the use of statements on Bruno's death. Superficially, the evaluations of Bruno's significance seem a jumble of opinions. The evaluations of the reasons for his death fall, in contrast, into two broad, though distinct, camps.[18] For reasons of simplicity, therefore, the judgments on Bruno's death serve as the point of departure for this project.

Focussing on the purported reasons for his execution also simplifies the confusion over Bruno's significance. Two basic positions on his importance in the creation of modern science emerge from an examination of the alleged reasons for his death. The first position emphatically asserts that Bruno played a major role in the Scientific Revolution and attributes his death to persecution for the espousal of the new science.[19] At the opposite pole, the other position tends to

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[18] Ibid. These two works provide some indication of the range of opinion on Bruno.

[19] Riley, 124, 126, 135.

deny that Bruno contributed anything of value to modern science and either avoids or rejects outright the contention that science was his downfall.[20]

The story of Bruno's image in the history of science does not end with the assertion of two sets of opinions that cover the reasons for his death and the extent of his significance. These two schools of thought form the nuclei for two broad and contrasting interpretive schemes of the development of modern science. Both schemes can, overall, claim comparable numbers of adherents. Moreover, both schemes have co-existed at least since the mid-nineteenth century. Despite these similarities, the two patterns of interpretation offer contrasting assumptions about the nature of the relationship between science and religion and about the development of modern science.[21]

The Image of Bruno

The categorization of the rationales for Bruno's death is the first problem for this thesis. The definition of "martyr to science" will serve as the basis for delineating the other categories of thought on Bruno's death. In this context, the expression "martyr to science" will mean that Bruno's execution resulted from his adherence to ideas that opposed the medieval Ptolemaic-Aristotelian cosmology. For the most part, this definition refers to Bruno's alleged acceptance

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[20] Francis R. Johnson, *Astronomical Thought in Renaissance England*, (Baltimore, Md.: The Johns Hopkins Press, 1937; rprt. New York: Octagon Books, 1968), 168.

[21] The next chapter will delineate the origins of the martyr to science view of Bruno. As examples of the longevity of the two schools of thought see Andrew Dickson White, *The History of the Warfare of Science and Christendom*, (1896; New York: George Braziller, 1955), 129-130, and William Whewell, *History of the Inductive Science*, 3 vols., (1857; rprt. London: Frank Cass and Co., Ltd., 1967).

of Copernicanism.[22] Some writers, however, attribute Bruno's demise more to his own peculiar brand of cosmology than to heliocentrism as Copernicus conceived of it.[23]

This distinction makes no difference in categorizing Bruno's fate. His death, in both cases, resulted from his adherence to doctrines that were contrary to the medieval scientific tradition. Identification of "martyr to science" claims is thus very easy. Works that assert the "martyr to science" claim explicitly argue that cosmology, whether Copernican or personal, brought the Inquisition down on Bruno.[24] Using the "martyr to science" definition as a sort of litmus test also facilitates the classification of claims about Bruno's death. Any works that do not connect Bruno's death to his cosmological ideas, or directly reject such a connection automatically fall into a separate category. Works that advance no explanation for Bruno's death or omit any mention of him also fall, as Chapter Three will show, into this category.

The Science-Religion Relationship

Assumptions about the nature of the science-religion relationship in the early modern period compose the next area for study. The examination of this relationship will include both the broad question of the interaction of science and

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[22] Mayer, 7.

[23] Rene Taton, ed., *History of Science*, vol. 2, *The Beginnings of Modern Science 1450-1800*, trans. A. J. Pomerans, (1958; New York: Basic Books, 1964), 72-73.

[24] Mayer, 7; Taton, 2:72-73.

religion and the more specific problem of Catholic and Protestant reactions to the new science. In general, assumptions about the relations between early modern science and religion translate into three categories of attitudes about religion. A work that posits an essential hostility between early modern religion and science falls into the "anti-clerical" category. Next, works that either express the existence of clerical hostility toward science, but offer mitigating circumstances that place the source of hostility outside of religious doctrine, or works that eschew an investigation of the science-religion relationship, constitute the "neutralist" category. Finally, works that promote the view that religion and science shared no innate hostility make up the "pro-clerical" category. The examination of assumptions about Protestant and Catholic reactions to the new science will also use the same three categories.

The Nature of the Scientific Revolution

The final component of the two interpretive schemes involves the nature of the transition for medieval to modern science. During the sixteenth and seventeenth centuries, science underwent a remarkable transformation. A new view of the natural world supplanted the 2,000 year-old tradition of Aristotelian science. An intense debate rages over the processes that created the new view of nature. Essentially, the arguments fall into three groups. One group argues that changes in scientific knowledge are continuous with past traditions. The development of science thus traces a smooth path between the past and the

present.[25] A second group adopts an opposing stance. Scientific knowledge, this group of arguments asserts, develops through discontinuous changes. New ideas burst onto the scene and,in short order, topple the established school of thought.[26] In between these two extreme positions is a third camp that mixes elements of both continuity and discontinuity. Holding the title of Renaissance discontinuity, this school of thought asserts that modern science arose from the infusion of classical Greek learning into Western Europe at the end of the Middle Ages.[27]

At one extreme of historical opinion lies the absolute discontinuity school of thought. According to this category, modern science arose form the rejection of its intellectual antecedents. Works that fall into this category, therefore, draw no connections between modern and medieval science or any other past tradition. Thomas Kuhn's *The Structure of Scientific Revolutions* presents the best-known example of an absolute discontinuity model. In Kuhn's view,"Scientific Revolutions are here taken to be those non-cumulative developmental episodes in which an older paradigm is replaced in whole or in part by an incompatible new one."[28] Kuhn concedes that at times scientific knowledge possesses a cumulative

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[25] Joseph Agassi, "Continuity and Discontinuity in the History of Science," *Journal of the History of Ideas*, no. 4, 1973: 609, 616-623.

[26] Ibid., 609-614.

[27] Ibid., 624.

[28] Thomas Kuhn, *The Structure of Scientific Revolutions*, 2nd. ed., (Univ. of Chicago Press), 92.

nature.[29] Scientific development, however, occurs only when science discards its cumulative aspect and rejects the accepted tradition.[30]

The Renaissance discontinuity category occupies the middle position. This category includes works that associate the transition from medieval to modern science with the introduction of previously unknown Greek scientific writings into Europe in the late Middle Ages. Like the thinkers of the Renaissance era, the Renaissance discontinuity category effectively cuts the Middle Ages off from the historical development of modern science and ties the modern intellectual tradition directly to ancient Greek learning. Most works in this category regard the medieval intellectual tradition as worthless, or even as an impediment, to the development of modern science. Moreover, works in this category often see modern science as a continuation of Greek learning.[31]

As a result, the Renaissance discontinuity category is a compromise in the discontinuity-continuity debate. The Scientific Revolution was discontinuous in the sense that the sudden influx of Greek learning disrupted the course of medieval science. The connection with that same learning, however, established an intellectual continuity between two bodies of knowledge across the expanse of the Middle Ages. A notable example of the Renaissance discontinuity category is Alexandre Koyre's work on the origins of Galileo's scientific ideas. Koyre

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[29] Ibid., 96-97.

[30] Ibid., 3-13; Agassi, 623.

[31] Whewell, 1:271, 276, 299

describes the Scientific Revolution as a "mutation."[32] So abrupt and so complete was the change, Koyre argues, that the Aristotelian worldview vanished without a trace.[33] An altered form of Platonism, which had first entered Western Europe during the Renaissance, acted as the catalyst for the development of modern science.[34]

The third and final category are arguments in favor of absolute continuity. On the far left of the spectrum, the absolute continuity category basically inverts the claims of the absolute discontinuity supporters. Works in favor of continuity directly connect modern science to its medieval predecessor. Pierre Duhem, for example, argues for a distinctly continuous view of science. According to him, science in the early modern period extended and modified the long-established principle that scientific explanations should be solely instrumental accounts of natural phenomena. As the cardinal principle of western science since the Greeks, the continued use of this principle insured the continuity between medieval and modern science.[35]

Three criteria will determine the placement of works into the proper category. This thesis will not, however, apply all three tests to every work. Since arguments about the nature of the Scientific Revolution can focus on the contributions of the major figures responsible for the creation of modern science

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[32] Alexandre Koyre, *Galileo Studies*, trans. John Mepham, (Atlantic Highlands, N. J.: Humanities Press, 1978), 1.

[33] Ibid., 3

[34] Ibid., 208-209.

[35] Pierre Duhem, *To Save the Phenomena*, trans. Edmund Doland and Chaninah Maschler, (Chicago: Univ. of Chicago Press, 1969), 114-117.

or on the large scale trends of the transition between medieval and modern science, a work need adhere only to a single, appropriate criterion to establish its inclusion in a category. The obvious first criterion, and the most rare, is a direct statement about the nature of the relationship between medieval and modern science. Generally, most historians of science do not address this issue explicitly. The reader must, as a result, employ two other tests to reveal a work's conclusions on the nature of the Scientific Revolution.

Copernicus's role in creating the Scientific Revolution serves as the second criterion. For many works, Copernicus is an excellent starting point because of the almost universal agreement about his significance in initiating the Scientific Revolution. The central question here is the presence of immediate predecessors to his work on heliocentrism. Affirming the presence of predecessors places the work in the continuity category. Denial indicates that the work belongs in either the absolute or Renaissance discontinuity categories. The role of Greek science, as discussed above, will be the deciding factor between the two discontinuity categories. Statements on the development of medieval science will also, where appropriate, perform the same task. In this case, the decision turns on whether a work portrays medieval science as an evolving system or as a dead-end. A view of medieval science as vigorous and dynamic usually denotes a continuist outlook. Conversely, a view that characterizes medieval science as fruitless almost certainly fits into one of the two discontinuity categories. Once again the decision as to which one rests on the role of Greek science.

Patterns of Explanation in the History of Science

The Martyr to Science Scheme

Applying the preceding definitions and categories to the history of science generates two distinct interpretive schemes. The first scheme accepts as one of its basic assumption that early modern religion was hostile to the new science. This scheme also presupposes that modern science is discontinuous with the medieval scientific tradition. The second scheme, on the whole, considers the relationship between science and religion to have been much more hospitable that the first scheme is willing to admit. Furthermore, the second school of thought offers arguments for a continuity between medieval and modern science. The application of these assumptions, along with the assumptions about the reasons for Bruno's death, inevitably leads to two different evaluations of the historical setting and evolution of modern science.[36]

According to the first scheme, which attributes Bruno's death to his science, Bruno was a "martyr to science". With impeccable logic, the "martyr to science" scheme integrates the alleged reasons for Bruno's execution into a framework that justifies both an anti-clerical attitude and a revolutionary view of the origins of modern science. The connection between Bruno's execution and anti-clericalism is usually explicit. Most sources that adopt the "martyr to science" scheme directly accuse the Roman Catholic Church of deliberately

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[36] White, 120-130, serves as an example of the first scheme. Johnson, 7-8, 61-65, 94-95, 114-116.

seeking the death of Bruno an account of his support for the new science. The same sources also frequently claim that Catholics, and often the early Protestants as well, evinced considerable hostility towards any innovations in scientific thought. In the eyes of early modern religious authorities, the anti-clerical position claims, new scientific ideas threatened the validity, and hence the power, of religious dogmas. As a result, the science-religion relationship is inherently and inevitably antagonistic. Supporter of the first scheme argue that this hostility often manifested itself, particularly in the case of the Catholic Church, in attempts to actively suppress scientific knowledge. Histories of science that espouse the first scheme thus portray early modern religion as an obstacle to the progress and, at times, even as the sinister and calculating enemy of reason and enlightenment.[37]

Characterizing the emergence of early modern science as revolutionary completes and reinforces the first scheme. Probably because of its association with the Church, medieval science receives a great deal of abuse from works that advocate the "martyr to science" model. Such works usually ignore medieval science or attack it as an impediment to scientific progress. Also, a rejection of medieval science fits into the logic of the first scheme. A new system of knowledge that broke sharply with the medieval intellectual tradition and, as a consequence, threatened religion's monopoly on learning provides a possible rationale for the the supposedly harsh reaction of the religious authorities to the new science. Obviously, from this point of view, the religious authorities could

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[37] The classic example is of course, White, 122-129.

not tolerate someone like Bruno who refused to parrot the official doctrine on matters relating to science. He, and others like him, represented a competing source of intellectual authority. Bruno thus became the unfortunate victim of his science because he spoke his mind in an intolerant society that was in the midst of a violent upheaval. While explicit statements that link the nature of the of the science-religion relationship and the Scientific Revolution to the manner of Bruno's death are rare, such a logical connection appears to be an unspoken assumption in most of the works that adopt the "martyr to science" interpretation.[38]

The Anti-Martyr to Science Scheme

The second school of thought is essentially a mirror image of the first one. While maintaining the same logical structure as the first scheme, the second scheme inverts the relationship of all three components common to both sets of interpretations. The second scheme, in general, rejects science as the reason behind Bruno's death and connects a relatively mild position on the religion and science conflict with continuist view on the development of modern science. Almost without exception, this scheme appears as a direct, conscious reaction against the "martyr to science" scheme. Consequently, the more extreme

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[38] H. S. Williams and Edward H. Williams, *A History of Science*, 5 vols., (New York: Harper and Brothers, 1904), 2: 13-14, 53-54, 66-67, 81-82.

anti-clerical and discontinuity views rarely appear among works that adopt the second scheme.[39]

Furthermore, by claiming that Bruno died for reasons other than his science, the second scheme escapes the necessity of creating a framework that explains Bruno's death in terms of clerical obscurantism and a violent intellectual revolution. The circumstance of Bruno's death become irrelevant to the history of science and so other criteria supply the basis for judgments on the relationship between science and religion and on the nature of the Scientific Revolution. As a result, the links between the components of the second scheme tend to be much looser than was the the case in the first scheme. Unlike the "martyr to science" scheme, a number of works deviate from the basic pattern on either the conception of the science-religion relationship or the nature of the Scientific Revolution.[40] Nevertheless, the second scheme holds together well enough, overall, to provide a noticeable contrast with the first scheme.

Works that follow the second scheme usually brand Bruno a religious heretic and always question whether any aspect at all of his thought deserves the appellation of science. Bruno died, these works argue solely, for his religious errors and not because of a conflict between science and religion. Although the relationship is not always as close as in the first scheme, supporters of the second scheme tend to paint a more hospitable picture of the relations between religion

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[39] A. C. Crombie, *Medieval and Early Modern Science*, 2 vols.,(1952; Garden City N. Y.: Doubleday, 1959), 1: 6-7, 2: 103-104, 110, 113, 167-168, 207-208, 216.

[40] For deviation on the continuity-discontinuity issue see Thomas Kuhn, *The Copernican Revolution*, (Cambridge: Harvard Univ. Press, 1957), 92, 99; For anti-clericalism in the second scheme see Patrick Moore, *The Development of Astronomical Thought*, 2nd. ed., (1969; Hornchurch, Essex: Ian Henry Pub., 1981), 16, 20-24, 28.

and science.[41] Bruno's death at the hands of religious authorities though, leaves room for at least a tinge of anti-clericalism in the second scheme.[42]

In line with the logical progression of both schemes, the second scheme shies away from revolutionary views of the development of modern science. Since science was neither the issue in Bruno's death nor an object contention with the clergy, the creation of modern science need not, following the logic of the two schemes, have been a revolutionary act. This scheme, unlike the " martyr to science" scenario, tends to argue that modern science is the offspring of the medieval intellectual tradition and to express more favorable opinions on the value and achievements of medieval science.[43] The removal of science as an issue of violent controversy in the early modern period is not, in itself however, a sufficient reason to reject a revolutionary view of the origins of modern science. An alternative explanation, certainly, could account for a violent break with the established without incorporating elements of anti-clericalism or the "martyr to science" argument. Works that adhere to the second scheme, as a result, deviate at times from linking a continuist view of the Scientific Revolution to an absence of conflict between religion and science.[44]

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[41] Johnson, 94-95, 114-116.

[42] Moore, 16, 20-24, 28.

[43] Crombie, 1:6-7, 2:110, 113.

[44] Kuhn, *Copernican Revolution*, 92, 99, 192-199.

Plan of the Work

Chapter Two will apply these analytical categories to works that label Bruno a "martyr to science". Originating in the nineteenth century, the "martyr to science" interpretation of Bruno provides, as Chapter Two will show, a powerful organizing principle. Works that adopt a "martyr to science" view tend toward both the anti-clerical and discontinuity positions. These works, moreover, demonstrate a remarkable degree of adherence to this basic interpretive pattern. The effect of such consistency is an highly coherent and emotionally powerful image of the history of science.[45]

The third chapter will present a contrasting view of Bruno. Specifically, Chapter Three will examine works that reject or omit the image of Bruno as a "martyr to science". To some extent, works that reject the "martyr to science" view tend to display an interpretive scheme that is the mirror image of the works in Chapter Two. Overall, the rejection of the thesis that science led to Bruno's downfall tends to produce a considerably less hostile attitude toward both early modern religion and the medieval intellectual tradition.[46] This interpretive scheme, unlike the "martyr to science" scheme, demonstrates considerable instability and would thus seem to undermine the claim that the way historians depict Bruno tends to shape the interpretive structure of histories of science. Actually, the very instability of the anti-martyr interpretations represents a

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[45] Dorothy Stimson, *The Gradual Acceptance of the Copernican Theory of the Universe*, (New York: Taylor and Baker, 1917)27-28, 39-41, 87, 99-101.

[46] Crombie, 1:6-7, 2:110, 113.

significant source of support for the central contention of this thesis. The elimination of a specific and highly emotional image of Bruno as a defender of scientific truth grants greater interpretive freedom to historians of science. No longer do histories of science have to erect interpretive schemes that explain the "martyr to science" phenomenon. As a result, some aspects of the "martyr to science" scheme may appear among the "anti-martyr to science" scheme for reasons that are totally unrelated in any logical sense to the status of Bruno.[47] Finally, a brief conclusion will reflect on the impact that the image of Bruno has had on the history of science.

[47] Kuhn, *Copernican Revolution*, 92, 99, 192-199.

Chapter Two: Bruno as a Martyr to Science

Introduction

Since 1600, the evaluations of Bruno's place in history have, undergone several major shifts. During the 17th and 18th centuries, Bruno attracted very little attention. The few writings about Bruno and his philosophy were decidedly unsympathetic. These works usually portrayed Bruno as an heretical troublemaker who received a proper and fitting punishment for his crimes.[1] An abrupt reversal of Bruno's image emerged, however, in the mid-nineteenth century. Beginning with the publication of several biographies in the 1840s, the remainder of the century saw Bruno's popularity, as well as his status, increase dramatically. Bruno ceased to be a mere religious criminal and, instead, acquired heroic stature. At its height, this reassessment of Bruno transformed him into a unjustly persecuted defender of intellectual freedom. This view of Bruno, coupled

[1] Michel, 9-10.

with a facile understanding of his philosophy, transformed him into the quintessential "martyr to science."[2]

Beyond the internal reasons for the acceptance of Bruno as a "martyr to science" that the first chapter examined, were a number of external factors that nurtured Bruno's rise to prominence in the history of science. Although a full delineation of these factors falls outside the scope of this work, a brief overview will provide some context for understanding the "martyr to science" phenomenon. Bruno's abrupt shift in status occurred in response to a number of broad political, religious, and intellectual events within Italy. Among these events was the drive for Italian unification and the concurrent quest for a pantheon of national heroes as a source of national pride and identity, the nineteenth-century Church's reaction against modern morals and philosophy, and the nineteenth century's adoration of science. In such an atmosphere, the elevation of Bruno in a "martyr to science" became almost inevitable. After all, Bruno was an Italian who espoused apparently modern scientific ideas and who also lost his life at the hands of the Church. Italian intellectuals easily arrived at the obvious conclusion: Bruno, a man of science, was the victim of a Church that was violently intolerant of new scientific ideas.[3] Explaining the acceptance of Bruno's status as a "martyr to science" outside of Italy is more problematic. Undoubtedly, nineteenth-century Western culture's belief in science as the paragon of knowledge played a major role in permitting the transfer of Bruno's

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[2] Boulting, 306; Yates, *Hermetic Tradition*; 450; Michel, 10-11; Gosselin and Lerner, 22-23.

[3] Michel, 10-11; Gosselin and Lerner, 22-23.

status as a "martyr to science" from an Italian context to the rest of Europe and to the United States. Such a pro-science setting could have easily accepted and sustained a "martyr to science" image of Bruno despite the absence of the original conditions that spawned the "martyr to science" concept.

Although all of the historical works in this chapter agree that Bruno's scientific ideas led to his downfall, disagreement exists over the nature of that science. Many works posit Bruno's adherence either to Copernicanism in general or to specific aspects of Copernicus's work, as the primary motive for his execution.[4] On the other hand, other writers draw a distinction between Copernican cosmology as it appears in the *De Revolutionibus* and the variation of it that Bruno espoused. According to these works, Bruno suffered as result of his own peculiar ideas about the nature of the universe rather than from an allegiance to Copernicanism.[5] A final group of works asserts that the source of Bruno's conflict with religion lay not in his conclusions about physical reality itself, but in the philosophical or theological conclusions that Bruno drew from heliocentrism.[6] Despite these differences, the "martyr to science" paradigm remains basically stable. Throughout these works, Bruno's death in defense of science supports anti-clerical sentiments and some form of discontinuity.

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4 White, 129-130.

5 Antonie Pannekock, *A History of Astronomy*, (1951; New York: Interscience Publishers, Inc., 1961), 224.

6 Cecil J. Schneer, *The Evolution of Physical Science*, (New York: Grove Press, 1960), 47-48.

Bruno as a Follower of Copernicus

The first category of works to be examined are those works that attribute Bruno's execution to his adherence to Copernican astronomy. Andrew Dickson-White's, *The History of the Warfare of Science and Christendom* (1896), provides the earliest example of this position. White connects Bruno's faith in the Copernican system to his execution in no uncertain terms.[7] Indeed, White's characterization of Bruno's role in the dissemination of Copericanism makes it clear that White holds profoundly anti-clerical opinions. Bruno, in White's analysis, paid the ultimate price precisely because his Copernicanism challenged the authority of a Church that resisted any threat to its hegemony over knowledge.[8] Regarding the discontinuity issue, White espouses a loose Renaissance discontinuity position. He acknowledges the antiquity of the heliocentric model of cosmology and thus implies that ancient Greece supplied the raw material for the Scientific Revolution. Nevertheless, White does not make the explicit claim that early modern science was a revival of ancient Greek science.[9]

Chronologically, Dorothy Stimson's, *The Gradual Acceptance of the Copernican Theory of the Universe* (1917) is the next example of this sort. Less assertive in its claims for Bruno's martytdom to science than is White's book,

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[7] White, 129-130.

[8] Ibid., 122-129.

[9] Ibid., 120-121.

Stimson nevertheless maintains the same basic outlook.[10] On the issue of the alleged conflict between science and religion, she posits an essentially anti-clerical position by noting the hostility between the new science and the contemporary religious authorities. She does not attribute this hostility to any historically contingent factors and, therefore, implies that the conflict was due to an inherent conflict between science and religion. Stimson also distinguishes between Catholic and Protestant reactions to the new science. Bruno's alleged fate as a martyr to science plays a critical role in permitting Stimson to make such a distinction. In particular, she argues that Protestants and Catholics underwent a role reversal in their attitudes to the new science. Skepticism and Scriptural conflicts led the Protestants, Stimson admits, were the first to object to the new science to raise the first objections to the new science.[11] Catholics, by contrast, did not move against the theory until Bruno's ideas provoked them into action in the early seventeenth century. Then, after an initial period of resistance, Stimson argues that Protestants accepted the new science.[12] Meanwhile, the Catholic Church blocked the spread of the new ideas.[13] Bruno becomes the means to explain the distinction between the two groups. By arguing that Copernicanism was the main issue in Bruno's execution, Stimson is able to support the claim that Catholicism was hostile to the new science. Stimson completes the equation with a statement of absolute discontinuity between Copernicus and the Middle Ages. Her

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[10] Stimson, 51-52.

[11] Ibid., 39-41.

[12] Ibid., 101-103.

[13] Ibid., 87, 99-101.

characterization of Copernicus's work as a profound departure from tradition obviously denies any continuity between Copernicus and the medieval world.[14]

Nine years later, in 1926, Woodbridge Riley reiterated the formula. In *From Myth to Reason*, Riley flatly states that Bruno's death resulted from his adherence to Copernicanism.[15] To Riley, Bruno was a great hero of modern science who overthrew the sterile medieval tradition.[16] Unfortunately for Bruno Riley argues, reformers of any sort usually encounter fierce resistance from the established authorities.[17] Riley, therefore, asserts that the religious authorities immediately acted to halt the development of the new science thus indicating the the presence of an inherent science and religion conflict.[18] He makes no references to Protestant reactions. Finally, Riley explicitly adopts the Renaissance discontinuity view that the revival of Greek science spurred the development of modern science.[19]

The following year, Joseph Mayer's *The Seven Seals of Science* (1927),also made an explicit connection between Bruno's Copernicanism and his execution.[20] Mayer holds to an extreme anti-clerical position and condemns both Catholics and Protestants as intellectual reactionaries.[21] Indeed, he traces a long history of

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[14] Ibid., 27-28.

[15] Riley, 124, 135.

[16] Ibid., 126.

[17] Ibid., 138-139.

[18] Ibid., 118-119.

[19] Ibid., 3-4.

[20] Mayer, 7.

[21] Ibid., 69.

ecclesiastical repression in intellectual matters.[22] Even the religious conflicts of the Reformation, which many writers usually cite as an external factor in explaining the hostility between religion and science, become, in Mayer's hands, an intensified phase of intellectual repression. In Mayer's view, the Reformation tends to indict religion rather than to acquit it.[23] Mayer characterizes the transition to modern science in Renaissance discontinuity terms.[24] In fact, he refers to the birth of modern science explicitly as the "Revival."[25]

Abraham Wolf's classic work, *A History of Science, Technology, and Society* (1935) presents a variation on the preceding characterizations of Bruno. Wolf does indeed cite Bruno's Copernicanism as the reason for his execution; however, he also concedes that was involved in a number of unnamed "heresies."[26] This extra item does not change the outcome of Wolf's interpretation. He presents a typically anti-clerical position. Both Protestants and Catholics resisted the new science. Wolf emphasizes as well an alleged history of antipathy between religion and science.[27] He notes, but does not explain, a time lag in the response by religious authorities to the new science. The Protestants, according to Wolf, registered the first disapproval of Copernicanism.

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[22] Ibid., 53, 61-62.

[23] Ibid., 61.

[24] Ibid., 45.

[25] Ibid., 65-66.

[26] Abraham Wolf, *A History of Science, Technology, and Philosophy in the 16th and 17th Centuries*, (1935; London: George Unwin Ltd., 2nd ed., 1950), 29.

[27] Ibid., 8

Nevertheless, the Catholic opposition soon followed.[28] Consistent with the works so far examined, Wolf maintains an explicit renaissance discontinuity view that makes early modern science the direct descendant of ancient Greek science.[29]

H. A. Reason' s *Road to Modern Science*, (1940), directly connects Bruno's execution to the Catholic resistance to Copernicanism.[30] In one of the few significant deviations from the formula of the martyr to science scheme, Reason draws a very sharp distinction between the reaction of Protestants and Catholics to the new science. Reason argues that Protestantism actually promoted science. By implication, such a view indicates that Protestants were always receptive to the new science. Reason's outlook on the Catholic Church, however, is clearly anti-clerical but highly complex. On the one hand, Reason characterizes the Church as obscurantist and even an anachronism in the rapidly changing intellectual life of the early modern period. On the other hand, Reason does not use an anti-clerical position to present the early modern Church as a formidable opponent of the new science. Despite the potential for hostility and interference from a reactionary institution as large as the Church, Reason perfunctorily dismisses the Church as entirely ineffectual in impeding the development of science.[31] Reason argues for the sporadic appearance of important scientific figures in the middle age. She denies, nevertheless, that such figures had any

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[28] Ibid., 25.

[29] Ibid., 1-2, 4-6, 24.

[30] H. A. Reason, *Road to Modern Science*, (New York: D. Appleton-Century Comp., 1940), 49.

[31] Ibid., 61.

influence on the emergence of modern science and adopts a strong discontinuity position.[32]

Hermann Kesten carries on Reason's basic pattern of interpretation in *The World of Copernicus* (1945). Kesten directly ties Bruno's death to his Copernican preachings.[33] He names the Protestants as the first opponents of the new science. By comparison, Keston asserts that the Catholic Church reacted slowly to the new science and only in response to provocation from Bruno's heliocentrism.[34] Nevertheless, Kesten also hoists the burden of guilt on the Catholics as he implies by noting that, after a time, Protestants could espouse Copernicanism with impunity while dire punishment awaited Catholic adherents of heliocentrism.[35] Kesten accentuates his Catholic anti-clericalism by claiming a long history of repression for the Church.[36] In the manner of Stimson, Kesten conceives of the emergence of modern science as a profoundly discontinuous event. A brief mention appears in his book of the ancient Greek ideas on heliocentrism, but he makes no clear connection between Greek and modern science. Copernicus receives most of the credit for single-handedly creating the scientific revolution.[37]

Gerard De Vaucouleur's *Discovery of the Universe* (1957) singles out heliocentrism as the critical factor in Bruno's execution. Vaucouleur spends little

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[32] Ibid., 45-46.

[33] Hermann Kesten, *Copernicus and His World*, (Trans. E. B. Ashton and Norbert Guterman, New York: Roy Publishers, 1945), 330.

[34] Ibid., 315-316.

[35] Ibid., 365.

[36] Ibid., 327.

[37] Ibid., 164-166, 168.

time discussing the conflict between religion and science. He simply notes the existence of conflict and then drops the subject.[38] In making this observation, Vaucouleur reveals an important feature of the assumptions that underlie this category of observations. He assumes that early modern religious authorities reacted violently to the new science because of "the fundamental character of the revolution which Copernicus effected in our conception of the world."[39] Such a comment reveals the integral relationship between anti-clericalism, scientific martyrdom, and discontinuity. Vaucouleur confirms the relationship by holding to the Renaissance discontinuity view of the scientific revolution that emphasizes the originality of Copernicus.[40]

Charles Albert Reichen's *A History of Astronomy* (1963) reiterates the now familiar claim that Copernicanism was Bruno's downfall.[41] In lock-step fashion, he adopts the anti-clerical position that epitomizes the martyr to science scheme by characterizing both Catholics and Protestants as violently resistant to the new science.[42] Reichen's view of the nature of the Scientific Revolution is not entirely clear. He obviously subscribes to a form of discontinuity.[43] Nevertheless, in several instances he appears to adopt a Renaissance discontinuity view.[44]

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[38] Gerard De Vaucouleur, *Discovery of the Universe*, (New York: Macmillan, 1957), 44-45.

[39] Ibid., 45.

[40] Ibid., 42.

[41] Charles Albert Reichen, *A History of Astronomy*, (New York: Hawthorn Books, 1963), 43.

[42] Ibid., 43-44.

[43] Ibid., 41.

[44] Ibid., 38, 41, 44.

The last member of the category to be considered here is Andre Neher's *Jewish Thought and the Scientific Revolution of the Sixteenth Century: David Gans (1541-1613) and His Times* (1986). The most recent example of the "martyr to science" ideology, Neher's book is something of an oddity among works on the scientific revolution because of its reformulation of the science and religion relationship. At first, Neher's portrait of the early modern period is consistent with the preceding accounts. Bruno, Neher argues, was guilty of several transgressions in the eyes of the Church. The most important crime, he claims, was that of being an adherent to Copernicanism.[45] Deviating from the pattern established by the earlier writers, Neher asserts that early modern theologians resisted Copernicanism because its implications simply seemed too wild and outlandish to be believable.[46] Neher notes that both Protestants and Catholics attacked the theory and resisted change, but here again Neher points out that Aristotelian principles, rather than theological doctrine *per se* provided the substance of the dispute.[47] As a result, Neher basically takes a neutralist stance on the relationship between science and Christianity. He turns the whole story on its head by introducing the idea that Jewish thinkers whole-heartedly accepted the new science and provided little resistance.[48] In character with this

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[45] Andre Neher, *Jewish Thought and the Scientific Revolution of the Sixteenth Century*, trans. David Maisel, (New York: Oxford Univ. Press, 1986), 9.

[46] Ibid., 181

[47] Ibid., 183-185.

[48] Ibid., 187, 200.

category, however, Neher adopts a renaissance discontinuity view of the development of modern astronomy.[49]

Two further works argue that the Inquisition charged Bruno with holding specific doctrines associated with Copernicanism. The older of the two works, Oliver Lodge's *Pioneers of Science* (1893), mirrors Neher's model. Lodge notes that Bruno's held a number of unorthodox ideas, but only specifically mentions Bruno's rejection of the immobility of the earth in connection with his death.[50] Lodge then posits a neutralist view on the origins of the science-religion conflict by attributing the hostilities to historically contingent factors. Lodge does not elaborate on this point, however.[51] Lodge adopts a discontinuity view of the scientific revolution that lays especial stress on the absolute nature of the break between the medieval and modern traditions.[52]

H. S. Williams's *A History of Science*, (1904), follows the "martyr to science" formula with exacting precision. He argues that Bruno's rejection of geocentrism provoked his execution.[53] Williams then proceeds to establish the case against religion. In a sharp critique, Williams blasts early modern religion as obscurantist and oppressive superstition that sought to control the minds of people everywhere.[54] The noticeable silence after the publication of the *De*

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[49] Ibid., 169.

[50] Oliver Lodge, *Pioneers of Science*, (London: Macmillan and Co., 1893), 108, 127 >

[51] Ibid., 109.

[52] Ibid., 13-14.

[53] Williams, 2:82.

[54] Ibid., 2:66-67.

Revolutionibus is explained as the result of the ever-present threat of punishment[55] Williams draws no distinction between Protestants and Catholics. Not surprisingly, Williams adopts a discontinuity view. He does mention a revival of the ideas of Aristarchus in close proximity to this and thus seems to support a renaissance discontinuity view, but the connection is far from clear.[56]

Almost as an afterthought, Arthur Berry, in *A Short History of Astronomy From Earliest Times through the Nineteenth Century* (1898), includes Copernicanism among the charges against Bruno.[57] Berry dates the science and religion conflict from the time of the introduction of the new science in the seventeenth century.[58] He only notes Protestant opposition.[59] On the other hand, Berry displays a relatively favorable view of the Catholic reaction to the new science by noting the relative leniency both after the banning of the *De Revolutionibus*[60] and in the trial of Galileo.[61] He expresses a standard Renaissance discontinuity thesis[62] that he modifies by an emphasis on Copernicus's originality.[63]

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[55] Ibid., 2:82.

[56] Ibid., 2: 53-54.

[57] Arthur Berry, *A Short History of Astronomy*, (1898; New York: Dover Pub., 1961),171.

[58] Ibid., 157-158.

[59] Ibid., 125.

[60] Ibid., 160.

[61] Ibid., 171.

[62] Ibid., 92-93.

[63] Ibid., 100.

Bruno as a Martyr to His Own Cosmology

Copernicus and heliocentrism were not the only sources of trouble, according to the "martyr to science" scheme, for Bruno. Two works from the early 1950's argue that Bruno met his end as the result of his own novel cosmological ideas. Both works imply that he incurred the wrath of the religious authorities because his cosmology radically broke with tradition. The first work, *A Concise History of Astronomy* (1950), by Peter Doig, for example, states that Bruno's ideas "were strikingly closer to modern ideas than those held by any contemporary with the exception of William Gilbert...."[64] Doig, however, does not explain why Gilbert did not face a fate similar to Bruno's. In fact, Doig does not easily fit into the standard "martyr to science" scheme. On the issue of the religious reaction to Bruno, Doig creates difficulties for categorization by giving theology equal weight with science as a factor in Bruno's condemnation. Doig notes the existence of religious opposition to Bruno's ideas, although, in this case, the source of the opposition is the Lutherans.[65] Nevertheless, he makes no comment on the significance of religious opposition. The fact that he does indicate a source of religious conflict without invoking any external, mitigating circumstances is sufficient, according to the definitions in Chapter One, to classify his work as anti-clerical. The debate over the nature of the Scientific Revolution presents a similar problem of classification. Doig plays down the significance of

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[64] Peter Doig, *A Concise History of Astronomy*, (New York: Philosophical Library, 1950), 57.

[65] Ibid., 52.

Copernicus.[66] He also indicates a growing discontent with a geocentric cosmology.[67] These sorts of characterizations would seem to indicate a continuity view. A closer reading of the reasons for his position on Copernicus's significance reveals that he appears to conceive of the transition to modern science as some sort of discontinuity. In Doig's view,

> Perhaps the celebrity of Copernicus, greatly deserved as it is, is more than his system should have brought him. It seems possible that the magnitude of his achievement had been to some extent exaggerated, owing to the reaction after so long a period of acceptance of the Ptolemaic system[68]

The emphasis on the longevity of the Ptolemaic system, together with the argument that such longevity has inflated claims of Copernicus's significance, implies a break with tradition.

A second general claim for Bruno's personal cosmology as the reason for his execution appears in Giorgio Abetti's, *The History of Astronomy* (1952). Abetti makes an implicit association between the novel nature of Bruno's ideas and Bruno's execution.[69] Abetti indicates a considerable degree of hostility to Bruno's ideas but, like Doig, names only the Lutherans as opponents.[70] By and large, Abetti sidesteps the whole issue. On the question of the Scientific Revolution, Abetti is perfectly clear. He dismisses medieval astronomy as virtually non-existent and adopts an explicit Renaissance discontinuity view.[71]

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[66] Ibid., 51.

[67] Ibid., 48.

[68] Ibid., 51.

[69] Giorgio Abetti, *The History of Astronomy*, trans. Betty Burr, (New York: Henry Schuman, 1952), 73.

[70] Ibid., 72.

[71] Ibid., 10.

The next group of works under this heading continues the argument that Bruno died as the result of his cosmological ideas. These works, however, focus on specific aspects of Bruno's cosmology, such as the doctrine of a plurality of worlds or an infinite universe, as the cause of his execution. John William Draper's *History of the Conflict Between Science and Religion* (1874), for example, singles out the plurality of worlds doctrine as the fundamental charge against Bruno.[72] A vociferous critic of religion, Draper characterizes early-modern religion as innately hostile to scientific innovation.[73] He casts Catholicism as the main villain in the alleged suppression of scientific progress.[74] By contrast, Protestantism, Draper claims, has been relatively friendly to science and, indeed, is entirely compatible with scientific thought.[75] Considering Draper's jaundiced view of the relationship between science and Catholicism, his discontinuous view of the emergence of modern science is no surprise. Draper not only dismisses the significance of medieval science, which was of course dominated by Catholic thinkers, to modern science but even dismisses the existence of a medieval scientific tradition.[76] Copernicus thus burst onto the scene and revolutionized science.[77]

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[72] John William Draper, *History of the Conflict Between Science and Religion*, (New York: D. Appleton and Comp., 1874), 179-180.

[73] Ibid., vi, 157-159, 217.

[74] Ibid., x-xi.

[75] Ibid., 364.

[76] Ibid., 157-159.

[77] Ibid., 168.

Thornwell Jacobs, *The New Science and the Old Religion*, (1927), asserts that a specific part of the plurality of worlds doctrine caused Bruno's downfall. In particular, Jacobs argues that Bruno's belief "that the sun was a star" had fatal consequences.[78] Jacobs depicts the early relationship between all forms of Christianity and science as immediately and unrelentingly hostile and thus qualifies for inclusion in the anti-clerical category. His analysis of the nature of the Scientific Revolution is an explicit statement of Renaissance discontinuity[79]

Antonie Pannekock's *A History of Astronomy* (1951), also cites the doctrine of plurality of worlds as the reason for Bruno's downfall. Pannekock spends relatively little time on the issue of religion's reaction to the new science. The few statements on the subject, though, leave the impression that intellectual innovation doomed Bruno.[80] As a result, one can infer the existence of some degree of hostility between science and religion. Pannekock's argument about the Protestant and Catholic reactions to the new science, however, clarifies and softens this initially anti-clerical outlook. Early resistance to Copernicanism came from the Protestants. The challenge of the Reformation, however, pushed the Catholic Church to crack-down on intellectual non-conformity.[81] On the subject of the nature of the Scientific Revolution, Pannekock adopts a Renaissance discontinuity thesis.[82]

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[78] Thornwell Jacobs, *The New Science and the Old Religion*, (1927; Georgia, U.S.A.: Oglethorp Univ. Press, 2nd. rev. ed., 1935), 11, 89, 481.

[79] Ibid., 11-13.

[80] Pannekock, 224.

[81] Ibid., 222.

[82] Ibid., 183-187.

Also in 1951, William Wightman's, *Growth of Scientific Ideas*, tied Bruno's execution to his cosmology. In this case, Wightman introduces the novel, and apparently unique idea, that Bruno went to the stake for challenging the idea that the heavens are immutable.[83] Making no distinction between Protestants or Catholics, Wightman depicts early modern religion as intolerant of the new science.[84] A Renaissance discontinuity view, rounds out Wightman's analysis.[85]

Seven years later Rene Taton's *History of Science* (1958), again addresses the issue of the role of the doctrines of the plurality of worlds and an infinite universe in Bruno's death. Taton modifies this claim slightly by including anti-Aristotelianism among the charges against Bruno.[86] Taton takes a mild position on the science and religion debate. According to him, ecclesiastical opposition to Copernicanism was not immediately in evidence. Indeed, the theory provoked the first outcry among secular scholars. Not until the seventeenth century did science draw the wrath of the religious authorities. At that time, Catholicism adopted an anti-science stance while Protestantism accommodated itself to science.[87] Taton offers no reason for the delay in responding to Copernicanism. Despite his mild position on religion, Taton adopts a straight discontinuity position.[88]

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[83] William P. D. Wightman, *The Growth of Scientific Ideas*, (New Haven: Yale Univ. Press, 1951), 396.

[84] Ibid., 44, 46, 59.

[85] Ibid., 44-45.

[86] Taton, 2: 72-73.

[87] Ibid.,2: 69-71.

[88] Ibid.,2: 57.

Two years later in 1960, Charles C. Gillispie, in his *Edge of Objectivity* attributes Bruno's execution to his doctrine of an infinite universe.[89] Gillispie deviates markedly from the pattern of this chapter by adopting a neutralist stand on the science and religion relationship. He explicitly denies the existence of an inevitable struggle between science and religion.[90] Even in the case of Galileo, he attributes the conflict to "the characters of men rather than the necessities in things."[91] Gillispie does note, in the manner of Weber, that Protestantism seemed more congenial to science than Catholicism. Superficially, such a position would appear to support an anti-Catholic stance. Gillispie, however, rejects the idea that either form of Christianity directly affected the course of scientific development.[92] Finally, Gillispie adopts a renaissance discontinuity view with his assertion that an infusion of Platonism into the late medieval intellectual tradition sparked the Scientific Revolution.[93]

Stephen Toulmin and June Goodfield's *The Fabric of the Heavens* (1961) argues that Bruno's fatal error lay in his adherence to a belief in the infinity of the universe.[94] although Toulmin and Goodfield make few statements on the relationship between religion and science, they do indicate that Bruno's execution

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[89] Gillispie, 27, 84.

[90] Ibid., 47.

[91] Ibid., 48.

[92] Ibid., 114-115.

[93] Ibid., 10-11, 20-21.

[94] Stephen Toulmin and June Goodfield, *The Fabric of the Heavens*, (New York: Harper and Brothers, 1961), 191.

triggered a reaction against Copernicanism.[95] Prior to Bruno's appearance, the Church had been, for the most part, friendly to science. Any hostility to Copernicanism on the part of the religious authorities resulted from institutional inertia and was a passing phenomenon.[96] On the debate over continuity and discontinuity, Toulmin and Goodfield present a confusing picture. For science in general, they reject discontinuous change.[97] Nevertheless, they argue that early-modern astronomy experienced a sharp discontinuity.[98] On the basis of this statement their work just barely falls into the discontinuity category.

Jean Charon's *Cosmology* (1970) represents the penultimate work in this category. Charon, without hesitation, attributes Bruno's execution to his doctrine of the infinity of the universe.[99] Charon holds a relatively mild position on the dispute between science and religion. According to him, the core of the difficulty between religion and early-modern science lay not in theology but in the scientific difficulties raised by Copernicanism.[100] Charon also notes official Church support for Copernicus's ideas.[101] Charon presents a Renaissance discontinuity view of the Scientific Revolution, although he also loosely connects some aspects of modern science to the medieval traditions.[102]

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[95] Ibid.

[96] Ibid., 160-161.

[97] Ibid., 163-165, 182.

[98] Ibid., 210.

[99] Jean Charon, *Cosmology*, trans. Patrick Moore, (New York: McGraw-Hill Book Comp., 1970), 122.

[100] Ibid., 109-110.

[101] Ibid., 66-67.

[102] Ibid.,34, 43-46, 48, 54-60.

Zdenek Kopal's *Widening Horizons*, (1971) concludes this section. Specifically, Kopal argues that Bruno's untimely demise was due to his belief "that the sun was a star...."[103] Kopal notes that the initial hostility to heliocentrism arose among the Lutherans. Ultimately, because of the conflicts of the Reformation era, both branches of western Christianity rejected the new science. Because Kopal cites the Reformation as the main catalyst in the conflict between religion and science, he falls into the neutralist category.[104] Kopal completes his interpretation of the early modern period by adopting a Renaissance discontinuity view.[105]

Copernicanism as a Subversive Theology

The final sub-heading in this category concerns works that view Bruno's execution as the result of the theological implications of his heliocentric ideas. Rudolf Thiel's, *And There Was Light* (1957), falls into this category because he sees Bruno death as the result of unorthodox religious convictions, in this case pantheism, that derived from Copernicanism.[106] Thiel notes the early opposition of the Protestants and the growing intolerance of the Catholics in the wake of the Reformation when ideogical conformity became all important.[107] The intolerance

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[103] Zedenek Kopal, *Widening Horizons*, (New York: Taplinger, 1971), 97.

[104] Ibid., 52.

[105] Ibid., 34, 43-46, 48.

[106] Rudolf Thiel, *And There Was Light*, trans. Richard and Clara Winston, (New York: Alfred A. Knopf, 1957), 109-113.

[107] Ibid., 88-89.

would ultimately culminate in the outright suppression of science in the case of Galileo.[108] Despite the expression of considerable hostility toward early modern religion, the attribution of the science-religion conflict to the Reformation places Thiel in the neutralist camp. On the other hand, he adopts an uncompromising discontinuity stance. He depicts the Middle Ages as virtually devoid of scientific achievement.[109] In contrast, he characterizes the early modern period as an abrupt break with the medieval intellectual tradition.[110] Reinforcing this discontinuous view is Thiel's insistence on the supreme originality of Copernicus.[111]

In the same year, George Sarton's *Six Wings: Men of Science in the Renaissance* makes a similar, though weaker, connection between Bruno's support for heliocentrism and his unorthodox religion.[112] Sarton takes an anti-clerical position and names the Protestants as the first opponents of the new science. The Protestant priority as an opponent to new science does not, however, in Sarton's eyes, prevent him from also characterizing the Catholic Church as hostile to Copernicanism.[113] As the author of a book about science in the

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[108] Ibid., 154.

[109] Ibid., 68.

[110] Ibid., 74-75.

[111] Ibid., 85-86.

[112] George Sarton, *Six Wings: Men of Science in the Renaissance*, (Bloomington, Indiana: Indian Univ. Press, 1957), 62.

[113] Ibid., 61-62.

Renaissance, Sarton, not surprisingly, adopts a Renaissance discontinuity position.[114]

The following year, Henry King's *The Background of Astronomy* (1958), also regards Copernicanism as a subversive influence. Rather than claiming that Copernicanism spawned a particular subversive theological doctrine, King believes that Bruno "stood for freedom of thought, and this was his downfall...."[115] King holds an initially anti-clerical position on the Protestant reaction to the new science. Within a short span of time, however, he argues that Protestantism actually became favorable to the development of modern science.[116] The Catholics, in contrast King argues, were slow to object to the heliocentric theory but ultimately displayed an ingrained intolerance towards the new science.[117] Finally, King directly connects the emergence of modern science to a revival of Greek learning and thus qualifies for the Renaissance discontinuity category.[118]

Cecil J. Schneer's *The Evolution of Physical Science* (1960), sees Copernicanism as an indirect cause, of Bruno's execution. Despite a passage in which Schneer seems to imply that Bruno was a conventional martyr to science, a closer reading of the text tends to support the position that the theological

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[114] Ibid., 4, 54-55.

[115] Henry C. King, *The Background of Astronomy*, (New York: George Braziller, 1958), 223.

[116] Ibid., 203-204, 224.

[117] Ibid., 206-207, 219-220, 224.

[118] Ibid., 6, 183-184, 192-193.

connotations of Bruno's science constituted the main issue.[119] In particular, Schneer argues that Bruno's heresies lay not in his support for the physical reality of heliocentrism. Instead, the difficulty, from the Church's point of view, was the unorthodox religious views that heliocentrism provoked in Bruno's philosophy.[120] As a result, Copernicanism was not, in itself, the cause of Bruno's execution. Schneer emphasizes this point by asserting that "Bruno was a mystic and his concerns were primarly theological."[121] Although Schneer does not make fine distinctions between Protestants and Catholics, he leaves the very strong impression that conflict between religion and the new science was inevitable.[122] Such conflict was inevitable, according to Schneer, because of the abrupt, discontinuous transition between the medieval and early modern intellectual traditions[123]

Bruno's legacy as a martyr to science lingers on in Charles A. Whitney's *The Discovery of Our Galaxy* (1971). Although modified by the assertions that "magical claims and political entanglements" also doomed Bruno, Whitney names Bruno's own cosmological ideas as the primary reason for his execution.[124] Whitney completely avoids any mention of the reaction of early modern religious authorities to the new science. On the question of the nature of the Scientific

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[119] Schneer, 374.

[120] Ibid., 47-48.

[121] Ibid., 54.

[122] Ibid., 80.

[123] Ibid., 53-54, 80.

[124] Charles Whitney, *The Discovery of Our Galaxy*, (New York Alfred A. Knopf, 1971), 13.

Revolution, however, Whitney is quite explicit. He adopts a strongly discontinuous view. Whitney does make some references to early modern science in Renaissance discontinuity terms, but he provides insufficient analysis for a decision as to whether this term indicates a revival of Hellenistic science or more simply, a resumption of scientific activity after the Middle Ages.[125]

Bernard Lovell's *In The Center of Immensities*, (1978), again asserts that the theological consequences of heliocentrism led Bruno to the stake. Specifically, Lovell claims that, to the religious authorities of the sixteenth century, Bruno's scientific beliefs held unsettling and unorthodox conclusions. As a result, the religious authorities found Bruno to be a threat and had him executed.[126] Perhaps because of this latent theological danger, although this connection is not clear, Lovell portrays the early modern church as intrinsically hostile to the new science.[127] Although he notes Lutheran resistance, the bulk of the blame falls on the Catholics.[128] Finally, Lovell adopts a Renaissance discontinuity view.[129]

Lovell essentially repeats the same pattern in his 1981 book, *Emerging Cosmologies*. Bruno met his end because of the unsavory theological consequences of his cosmology.[130] Not surprisingly, Lovell retains the anti-clerical position that he manifested in his earlier work.[131]Indeed, he elaborates on the

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[125] Ibid., 8-12.

[126] Bernard Lovell, *In the Center of Immensities*, (New York: Harper and Row, 1978), 3-4.

[127] Ibid., 4, 10-11, 13.

[128] Ibid., 10-11.

[129] Ibid., 9.

[130] Bernard Lovell, *Emerging Cosmolgies*, (New York: Praeger, 1985), 85.

[131] Ibid., 37.

existence of religious opposition to the new science. Specifically, he presents a more detailed exposition of the Protestant resistance to heliocentrism than was present in his earlier work.[132] Catholic resistance also receives more extensive treatment.[133] At one point Lovell grudingly acknowledges the possibility of the Reformation as an external source of hostility in the science-religion conflict. Nevertheless, this assertion is vague and seems to be an afterthought rather than an explanation for the purported clash between science and religion.[134] An explicit Renaissance discontinuity view rounds out Lovell's second work.[135]

Vincent Cronin, in *The View From Planet Earth* (1981), concludes this chapter with the contention that Copernicanism was the indirect cause of Bruno's execution.[136] Specifically, Cronin believes that Bruno's scientific ideas generated intolerably unorthodox religious ideas.[137] Cronin's only reference to the religion-science relationship is a condemnation of the Catholic Church's alleged attempt to suppress the new science.[138] Cronin supports a solid Renaissance discontinuity view of the origins of modern science.[139]

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[132] Ibid., 49, 52-54.

[133] Ibid., 54-55, 77, 85-87.

[134] Ibid., 87.

[135] Ibid., 37-42, 45-47.

[136] Vincent Cronin, *The View From Planet Earth*, (London St. James Place Collins, 1981), 121.

[137] Ibid.

[138] Ibid., 118.

[139] Ibid., 84-86, 102-104.

Conclusion

As the preceding argument has shown, works that portray Bruno as a "martyr to science" conform to a general interpretive pattern. Specifically, if a work portrays Bruno as a martyr to science, then the work also tends to adopt an anti-clerical outlook and a discontinuity view. The stability of this interpretive pattern provides a means of defining the second major group of works. In general, the works of the second group attribute Bruno's death to something other than his science, hold to a relatively mild view of the relationship between science and religion, and often support a continuity thesis. Nevertheless, this scheme is much less stable than among the first group of works. These works, however, almost always appear as an explicit response to the "martyr to science" thesis. As a result, the stability of the "martyr to science" thesis provides a source of unity for these works. The third chapter will thus consider the structure of arguments that reject the view of Bruno as a "martyr to science."

Chapter Three: The Rejection of Bruno's Martyrdom to Science.

The "martyr to science" claims for Bruno generate a highly specific image of the scientific revolution. Historians who portray Bruno as a victim of the intellectual changes that followed the publication of the *De Revolutionibus* reach, Chapter Two has shown, certain conclusions about the nature of scientific development and the religion-science relationship in the early modern period. In particular, the "martyr to science" thesis generally occurs in association with a revolutionary view of the origin of modern science. Proponents of Bruno's martyr to science status also posit the existence of considerable hostility between the holders of both Protestant and Catholic religious doctrines and the advocates of the new science. Taken together with Bruno's presumed status as a supporter

and victim of Copernicanism, these two conclusions add up to a powerful and coherent vision of the scientific revolution.[1]

Such a view, no matter how convincing, ever goes unchallenged for long. Paralleling the "martyr to science" view and its companion set of interpretations, is another, distinctly opposed interpretive scheme. This scheme self-consciously rejects the image of Bruno as a "martyr to science" Indeed, the most outstanding aspect of this parallel interpretative scheme is the extent to which it is a direct response to the "martyr to science" scheme. Generally, most works that oppose the "martyr to science" interpretation explicitly reject science as the basis for Bruno's execution. The most common counter interpretation places religion at the center of the conflict. Bruno, in short, came to grief over religious issues that had nothing to do with science.[2]

A counter position on Bruno's status also introduces an alternative set of interpretations about early modern science and its relations with religion. Once again, claims about the cause of Bruno's execution form the centerpiece of the second interpretive scheme. Proceeding from the assumption that Bruno's crimes had no connection with science, the second scheme elaborates a vision of early modern science that is essentially an inversion of the first scheme. A major characteristic of works in the second second scheme is, accordingly, a relatively benign view of the science-religion relationship. Moreover, works that fall into the second scheme tends to display a distinct aversion for interpreting the origins

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[1] Stimson, 27-28, 39-41, 51-52, 87, 99-103.

[2] Crombie, 2:207, footnote 13.

of modern science as a highly revolutionary event and tend towards continuity. In general, therefore, the second scheme depicts Bruno as a martyr to religion while rejecting the existence of inherent hostility between the early modern science and religion. Most of these works attribute any conflict that are external to any religious doctrine. Finally, works in the second scheme complete the interpretive sequence by assuming some degree of continuity between medieval and modern science.[3]

Overall, the second scheme is a mirror image of the first scheme. Nevertheless, significant variations from the basic interpretive pattern characterize the second scheme. Altering Bruno's status from a scientific to a religious martyr clearly robs the first scheme of much of its logical force and, hence, most of its persuasive power as well. The power of the first scheme rests on science as the common denominator that ties all three parts of the interpretive pattern together. Without Bruno as a martyr to science, claims about the revolutionary nature of early modern science or about the supposedly anti-scientific stance of early modern religion tend to become logically disconnected. Although the second scheme's depiction of Bruno as a religious martyr tends to produce a pattern of interpretations that is in complete opposition to the first scheme, this rejection of Bruno as a key player in early modern science frequently leads to a number of deviations from the basic pattern. Bruno, in the second scheme, becomes essentially irrelevant to the development of science. As a result, no clear logical connection exists between Bruno's fate

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[3] Ibid., 1:6-7, 2:103-104, 110, 113.

and issues like the nature of the scientific revolution or the relationship between religion and science. Interpretations of these aspects of the development of early modern science thus do not have have to mesh in any directly logical manner with the characterizations of Bruno. Any consistent connection that might emerge from an "anti-martyr to science" analysis is most likely a deliberate reaction against the conclusions of the martyr to science stance rather than the outcome of any deductive pattern of interpretation.[4]

Four basic groups works comprise the second interpretive scheme. The first, and largest, group attributes Bruno's execution to some particular religious heresy.[5] In a similar vein, the next group also treats Bruno as a victim of his religious doctrines. In this case, however, the works shrink from naming a particular belief as the cause of Bruno's downfall and simply cite "heresy" as the provocation for Bruno's execution.[6] The third group displays the influence of Frances Yates by naming Hermeticism as Bruno's fatal offense.[7] Finally, works that either ignore Bruno's fate[8] or omit him altogether[9] will close out the chapter.

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[4] Humphrey Thomas Pledge, *Since Since 1500*, (1939; Gloucester, Mass.: Peter Smith, 1969.), 13, 37-38, 54.

[5] Whewell, 1:294.

[6] W. E. Knowles Middleton, *The Scientific Revolution*, (1963; Cambridge, Mass.: Schenkman Pub. Co., 1967), 46.

[7] A. Rupert Hall, *The Revolution in Science*, 3rd. ed., (New York: Longman Group Ltd., 1983), 118.

[8] E. A. Burtt, *The Metaphysical Foundations of Modern Physical Science*, (1925; New York: Routledge and Kegan Paul, 1932).

[9] R. J. Harvey-Gibson, *Two Thousand Years of Science*, (New York: The Macmillan Co., 1931).

Bruno as a Martyr for a Religious Doctrine

The first category of works in this chapter depict Bruno as a martyr to a particular religious doctrine. No specific aspect of his religious thought emerges from the works under consideration as the sole cause of his martyrdom. Since no one has ever been able to determine the exact nature of Bruno's offenses, such a diversity of opinion is not really surprising. In fact, this chapter, despite the dismissal of science as the cause of Bruno's martyrdom, bears a remarkable resemblance to Chapter Two. Specifically, Chapter Three displays a remarkable variety of opinions on the exact religious doctrine that led to his execution.

The first work in this chapter that ascribes Bruno's demise to a named set of heretical religious doctrines is William Whewell's *A History of the Inductive Sciences* (1857). Whewell flatly dismisses science as the grounds for Bruno's execution. He attributes Bruno's death to his irreverent opinions about Catholic doctrines and practices.[10] In keeping with the tenor of the anti-martyr to science position, Whewell, furthermore, rejects the existence of inherent hostility between Catholicism and science. Any conflict that did occur he explains as the secondary result of the tensions of the Reformation era.[11] He makes no mention of the Protestant attitude toward early modern science. Whewell's work, perhaps fittingly since it is the first one to be considered, displays the erratic pattern of interpretation that characterizes these works. On the nature of the scientific

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[10] Whewell, 1:294.

[11] Ibid., 1:303-304.

revolution, he employs a Renaissance discontinuity view that starkly contrasts the brilliance of ancient Greece and the modern world with the alleged intellectual desolation of the middle ages.[12]

An interval of more than sixty years separates Whewell's work from Sir William Dampier's, *A History of Science and its Relations with Philosophy and Religion* (1929). Nevertheless, Dampier's study retains the characteristic resistance to the martyr to science thesis. The particular activities that led to Bruno's death appear, in Dampier's view, to have revolved around Bruno's unorthodox religion and his related opposition to established religion.[13] Dampier does assert that the early modern religious authorities did resist the new science. He justifies this resistance, however, as a natural response to a new and potentially threatening idea rather than as evidence of deep-seated hostility between science and religion.[14] Overall, Dampier inclines towards a Renaissance discontinuity view.[15] Nevertheless, he softens the discontinuity of the shift from medieval to early modern science by placing the origins of the metaphysics of modern science in the medieval intellectual tradition.[16]

The first half of the twentieth century witnessed Lynn Thorndike's compilation of his vast *A History of Magic and Experimental Science* (1941 for the volumes used in this section). Thorndike records the presence of references

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[12] Ibid., 1:271, 276, 299.

[13] Sir William Dampier, *A History of Science and its Relations with Philosophy and Religion*, (1929; New York: The Macmillan Comp., 1932), 124.

[14] Ibid., 129.

[15] Ibid., 107-108, 65-66.

[16] Ibid., 102-105.

to Bruno as a "martyr to science" in the historical literature.[17] Nevertheless, he clearly rejects such a title for Bruno. Thorndike notes a single instance of Bruno's scientific thought running afoul of the religious authorities. The incident, at least in Thorndike's description of it, carries more the tone of slight reprimand rather than a life-threatening condemnation.[18] According to Thorndike, "what counted most against him was his apostasy from his Order, his long association with heretics, and his questionable attitude as to the Incarnation and Trinity."[19] For Thorndike, the source of Bruno's reputation as a martyr to science lies more in the manner of Bruno's punishment and the later conflict with Galileo. The two events, on the surface, seemed to support the "martyr to science" thesis.[20] Although Thorndike's analysis of the science and religion relationship is a bit diffuse, he quite clearly views at least the early stages of Copernicanism's historical development as essentially free of conflict from either Protestants or Catholics.[21] More explicitly, he asserts that the major impediment to the acceptance of Copernicanism was the highly ingrained nature of Ptolemaic astronomy that discouraged the growth of new ideas. Active resistance by way of conflict with religion was a relatively minor factor.[22] In a clear case of conformity to the anti-martyr scheme, Thorndike adopts a straight-forward

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[17] Lynn Thorndike, *A History of Magic and Experimental Science*, 8 vols., (New York: Columbia Univ. Press, 1941), 6:423.

[18] Ibid., 6:427.

[19] Ibid.

[20] Ibid., 6:427-428.

[21] Ibid., 5:412-413.

[22] Ibid., 6:7.

continuity scheme. He argues that a study of early modern science in context reveals a considerable degree of dependence on the medieval tradition.[23]

Angus Armitage's *Sun, Stand Thou Still* (1947), examines Copernicus's life and work as well as the reception of heliocentrism. He explicitly rejects the notion of Bruno as a "martyr to science" and attributes Bruno's execution to purely religious heresies.[24] After expressing an apparently anti-clerical position,[25] Armitage later adopts a neutralist stance when he connects Catholic opposition to Copernicanism with the conflicts of the Reformation.[26] Moreover, his depiction of the conflict between science and religion as struggle between Copernicanism and Aristotelianism, rather than between Copernicanism and theology, further bolsters his neutralist position.[27] He follows the common pattern in the history of science that names the Protestants as the first to object to the new science, while Catholic opposition came more slowly.[28] A straightforward Renaissance discontinuity view caps off Armitage's analysis.[29]

Close behind Armitage's work is James Jeans' *The Growth of Physical Science* (1948). Once again, this work openly challenges the claims for Bruno's "martyr to science" status but in a more subdued tone. His work is particularly notable for the explicit recognition of the lack of documentation on Bruno's

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[23] Ibid., 2:971; 5:408; 7:11,13.

[24] Angus Armitage, *Sun, Stand Thou Still*, (New York: Henry Schuman, 1947), 164-165, 182.

[25] Ibid., 49, 51.

[26] Ibid., 132, 182-184.

[27] Ibid., 176.

[28] Ibid., 156-157.

[29] Ibid., 52-54.

execution.[30] As Jeans states, "others remind us that we do not quite know on what grounds Bruno was condemned."[31] Although less categorical than some of his predecessors, Jeans cites a number of religious heresies that he feels may have played a substantial role in provoking Bruno's execution. Among other crimes, Bruno "had denied the doctrines of transubstantiation and of the immaculate conception, and had written a pamphlet, *On The Triumph of the Beast*, in which the title-part was assigned to the Pope."[32] Regarding the relationship between science and religion, Jeans places the burden of blame for any hostility on particular incidents rather than on systematic repression. For example, Jeans argues that Bruno incurred the wrath of the religious authorities because of his work's extremely unorthodox nature quite apart from any questions of science. Copernicus, on the other hand, managed to keep his work within the bounds of orthodoxy.[33] The other conflict between Galileo and the Church, Jeans unequivocally attributes to hostility arising from Galileo's confrontational tactics rather than to battles over dogma.[34]

As one might expect from the foregoing discussion, Jeans holds a relatively soft position on the relationship between science and religion. According to Jeans, Copernicanism enjoyed a fairly peaceful existence in its earliest phases, at

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[30] Jeans, 140.

[31] Ibid.

[32] Ibid.

[33] Ibid.

[34] Ibid., 174-175.

least among Catholics.[35] He notes the subsequent tribulations of the condemnation of 1616 by indicating that "many things had combined to produce a different atmosphere by 1616."[36] Otherwise, he gives no specific reasons for the change in attitude. He does indicate that the new doctrine antagonized the Protestants, and particularly the Lutherans from its inception.[37] Jeans reveals a fairly consistent pattern of hedging his bets by producing a highly complex mixture of the continuity and renaissance discontinuity views. He adopts the Renaissance discontinuity view by linking the new science to ancient Greek science.[38] On the other hand, Jeans also places the development of modern science in the context of medieval tradition. In particular, Jeans views early modern science, and Copernicus as well, as indebted to the medieval intellectual tradition.[39]

A. C. Crombie's *Medieval and Early Modern Science* (1952), displays a more distinct pattern of argumentation than does Jeans' work. In fact, Crombie's study represents one of the clearest examples of the anti-martyr to science position. Mention of Bruno's execution appears almost as an afterthought in Crombie's work in a footnote that cites Thorndike as the authority for an anti-martyr to science position. Presumably, Crombie also shares Thorndike's conviction that Bruno met his end due to his adherence to unpopular religious

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[35] Ibid., 130.

[36] Ibid.

[37] Ibid.

[38] Ibid., 118-119, 128.

[39] Ibid., 118-120, 160-161, 168.

ideas.[40] Crombie is relatively silent on the religion and science issue. Nevertheless, he presents nothing to indicate an anti- clerical attitude. Even in the case of Galileo, Crombie resists the idea that religion impaired the development of science. When considering Copernicus's reluctance to publish the *De Revolutionibus*, Crombie argues that the sheer incredulity that was likely to greet the new theory constituted the major threat. Copernicus was more likely to be laughed out of town than burned at the stake.[41] Crombie ties off the pattern of interpretation by presenting a particularly clear example of the continuity thesis.[42] According to Crombie, "a more accurate view of 17th-century science is to regard it as the second phase of an intellectual movement in the West that began...[in the] 13th century...."[43] He attributes discontinuity theories to false perception of the middle ages that arose in the Renaissance.[44]

Thomas Kuhn's 1957 work, *The Copernican Revolution*, deflates the martyr to science claim for Bruno in a particularly effective manner. As was the case with the preceding works, Kuhn claims that Bruno met his end "for a series of theological heresies centering in his view of the Trinity...."[45] What is different about Kuhn is his injection of historical context into Bruno's execution. As a result, not only does he call Bruno a religious rather than a scientific martyr, he

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[40] Crombie, Footnote 13, 2:207.

[41] Ibid., 2:167-168, 207-208, 216.

[42] Ibid., 1:6-7; 2:113.

[43] Ibid., 2:110.

[44] Ibid., 2:103-104.

[45] Kuhn, *Copernican Revolution*, 199.

also reduces Bruno to merely one among many religious martyrs.[46] Although Kuhn notes the subversive potential of the Copernican system for established religious thought, and the increasing intolerance of religious figures toward science in the early modern period, he attributes most of difficulties to the conflict brought about by the Reformation and cites inherent doctrinal conflict as a secondary issue. Actually, most of the early resistance to the new science arose among the Protestants. Only gradually, in the context of the Reformation, did the new science become intolerable in the eyes of the Catholic Church. Kuhn underscores the historically contingent nature of the science and religion conflict by indicating that both Protestant and Catholic opposition had roots in the development of both groups. The Protestant quest for a literal, and supposedly more accurate, interpretation of the Bible compelled them to accept certain Biblical pronouncements as incontrovertible evidence against the Copernican system. In contrast, Kuhn argues, the pressures of the Reformation led the Catholics to an intolerant stand that might otherwise have never existed. In neither case did science itself provoke the hostility.[47] Another odd case in this interpretative scheme, Kuhn breaks ranks rather noticeably with the other works in this chapter on the nature of the scientific revolution. As his later work, *The Structure of Scientific Revolutions* reveals, Kuhn subscribes to a rather strong discontinuity position.[48] Although he does not present the full theoretical apparatus of his later work on scientific revolutions in the *Copernican*

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[46] Ibid.

[47] Ibid., 192-199.

[48] Kuhn, *Structure*, 92.

Revolution, Kuhn explicitly denies an evolutionary connection between the seventeenth-century scientific revolution and medieval scientific inquiry.[49]

Marie Boas's 1962 work, *The Scientific Renaissance*, categorically denies that Bruno was a martyr to science and lists a host of probable religious offenses that could have provoked his punishment.[50] The Protestants were the first to object to the new science. Catholic reaction came only after Bruno demonstrated the potential dangers of the new science. The implication of the Bruno incident is that hostility, though hidden, was inherent in the science and religion relationship.[51] Thus Boas falls into the anti-clerical camp. True to the title of the book, Boas upholds a clear Renaissance discontinuity view.[52]

William Wightman's *Science in a Renaissance Society* (1972), also characterizes Bruno as a purely religious heretic.[53] Wightman, however, is far less categorical about other aspects of early modern science. He expresses ambivalence about the nature of the relationship between science and religion. He indicates that the Lutherans, and, much later, the Catholics, attacked heliocentrism.[54] More generally, Wightman indicates that the introduction of new scientific doctrines entailed considerable peril. Almost immediately, though, he

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[49] Ibid., 99.

[50] Marie Boas, *The Scientific Renaissance 1450-1630*, (New York: Harper and Row, 1962), 125.

[51] Ibid., 124-127.

[52] Ibid., xi, 26-27, 88.

[53] William P. D. Wightman, *Science in a Renaissance Society*, (London: Hutchinson Univ. Library, 1972), 127-128.

[54] Ibid., 117.

retracts that claim.[55] A similar ambivalence towards the Scientific Revolution also characterizes Wightman's work. On the one hand, Copernicus does not represent, to Wightman, a sharp and immediate break with tradition[56] Wightman also refuses to view early modern science as a revival of Greek science.[57] Just prior to this statement, however, he invokes Thomas Kuhn's concept of paradigm change, and thus discontinuity, as an accurate description of heliocentrism's impact on the science of the early modern era.[58]

In 1978, Gale Christiansen's, *This Wild Abyss: The Story of the Men Who Made Modern Astronomy*, claimed that Bruno's anti-trinitarian beliefs sealed his fate. Consistent with the vast majority of other works in this chapter, he rejects science as a source of antagonism towards Bruno.[59] Christiansen notes the hostility that Protestants evinced toward the new science but dismisses it as "low-keyed".[60] Furthermore, he rejects the idea of an inevitable conflict between science and religion. The conflicts that did occur he attributes to such historically contingent factors as the Reformation and the acrimony that surrounded

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[55] Ibid., 121.

[56] Ibid., 18, 123-124, 128.

[57] Ibid., 119.

[58] Kuhn, *Structure*, 92. Cited in Wightman, *Science in a Renaissance Society, 120-121.*

[59] Gale E. Christiansen, *This Wild Abyss: The Story of the Men Who Made Modern Astronomy*, (New York: The Free Press, 1978), 157.

[60] Ibid., 133.

Galileo's relations with the Church.[61] Christiansen also adopts a strong discontinuity position.[62]

Robert Dekosky, in *Knowledge and Cosmos* (1979), expresses some hesitancy about the reason for Bruno's execution due to a lack of sources. Despite this reluctance to make a precise statement about the ideas that brought Bruno to the stake, he argues that religious rather than scientific ideas were the basic reason.[63] Specifically, Dekosky indicates that "his [Bruno's] condemnation probably rested on the accusations that he denied the divinity of Christ, that he had engaged in Satanic magical practices and, perhaps, that he was part of a secret, heretical magico-religious movement."[64] DeKosky's view on the science and religion relationship are not entirely clear. He seems to argue that Copernicanism was perfectly compatible with the religious sensibilities of the early modern period and encountered only sporadic and limited opposition. Nevertheless, Bruno's use of Copernicanism, with its unsavory theological consequences incurred the wrath of the Church.[65] Since a factor external to science, Bruno's unorthodox religion in this case, apparently sparked opposition to Copernicanism, one could argue that Dekosky supports a neutral position toward the science-religion conflict. Unfortunately for anyone seeking to fit DeKosky into a neat category, the doctrines that caused so many problems for

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[61] Ibid., 132-133.

[62] Ibid., 148-149.

[63] Robert DeKosky, *Knowledge and Cosmos: Development and Decline of the Medieval Perspective*, (Wash., D. C.: Univ. Press of America, 1979), 186.

[64] Ibid.

[65] Ibid., 183-187.

the Copernican theory, he claims, were the specifically cosmological ideas.[66] Such an assertion would seem to indicate at least the potential of conflict between religion and the new science. On the whole, however, he avoids an explicit portrayal of hostility between early modern science and religion. Finally, DeKosky tends toward a combination of the continuity and Renaissance discontinuity viewpoints. Early modern science owed its development to both the medieval scientific heritage and the revival of Greek science.[67]

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[66] Ibid., 185.

[67] Ibid., v, 46, 143, 150, 173.

Bruno as a Heretic

A number of other works also ascribe Bruno's death to the espousal of heretical religious doctrines. These works, however, do not indicate the precise doctrine that provoked the religious authorities to act against Bruno. The first such work to be considered is J. L. E. Dreyer's *A History of Astronomy from Thales to Kepler*, (1906). Dreyer contends that Bruno met his end because he was a "heretic."[68] Bruno, he admits, did accept Copernicanism as true.[69] Nevertheless, Dreyer rejects Copernicanism as a factor in precipitating Bruno's execution.[70] Accordingly, Dreyer appears to reject the idea of Bruno as a "martyr to science" Superficially, Dreyer possesses a markedly anti-clerical attitude. He states quite explicitly that Copernicus's ideas incited immediate opposition from both major branches of western Christianity.[71] The main villain in the clash between science and religion was, in Dreyer's view, the Catholic Church rather than the Protestants despite vehement Protestant resistance.[72]Earlier however, he presents a neutralist position by representing the Reformation as the major cause of intolerance towards the new science. Such intolerance was not inherent in the religion-science relationship he asserts.[73] Dreyer displays a similar tendency to

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[68] J. L. E. Dreyer, *A History of Astronomy from Thales to Kepler*, Rev. by W H. Stahl, (1906; New York: Dover Pub., 1953), 351.

[69] Ibid.

[70] Ibid., 416.

[71] Ibid., 416.

[72] Ibid., 418.

[73] Ibid., 351-352.

mix strong and weak statements about the nature of the Scientific Revolution. At several locations, he bluntly states that an intellectual rift separated modern science from all previous scientific traditions.[74] In the midst of these strong statements of discontinuity, Dreyer softens his characterization of the origins of modern science by insisting that modern science was a direct outgrowth of the Renaissance humanist revival of non-Aristotelian Greek thought.[75] According to the definitions of Chapter one, the presence of such statements qualifies Dreyer's depiction of the Scientific Revolution as a Renaissance discontinuity account.

A classic of the history of science, Herbert Butterfield's *The Origins of Modern Science* (1949), continues to be vague about the exact nature of Bruno's crimes.[76] Evidence that Butterfield does not view Bruno as a martyr to science rests on Butterfield's rejection of Bruno as a legitimate contributor to the development of modern science.[77] The Protestants, due to their insistence on Biblical literalism, registered the first opposition to the new science. The Catholic resistance followed decades later in the wake of unnamed external causes.[78] Butterfield further lessens the degree of inherent conflict between science and religion by counting Aristotelian objections and intellectual inertia as more significant in the resistance to the new science than theological scruples.[79] Despite

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[74] Ibid., 238, 306-308, 314-316.

[75] Ibid., 281-282.

[76] Herbert Butterfield, *The Origins of Modern Science 1300-1800*, (1949; New York: The Macmillan Comp., 1957), 57.

[77] Ibid., 36.

[78] Ibid., 55-56.

[79] Ibid., 58.

a highly glorified rendering of the place of the scientific revolution in the history of the human race,[80] Butterfield tends toward a evolutionary view of the development of science.[81] Nevertheless, he does introduce a mild Renaissance discontinuity view at some points.[82]

Alexandre Koyre's, *From Closed World to Infinite Universe (1957)*, notes Bruno's execution but refrains from stating a cause.[83] He makes only the barest mention of any hostility between science and religion.[84] As a result, Koyre's work is impossible to categorize. Finally, Koyre views modern science as the outgrowth of a revival, in the early modern period, of ancient Greek learning.[85]

Arthur Koestler's, *The Sleepwalkers* (1959), continues the trend of classifying Bruno as a victim of unnamed, and presumably, religious crimes. He sharply rejects the idea of Bruno as martyr to science by denying Bruno a role in the development of modern science.[86] Koestler, moreover, flatly denies any possibility of an inherent conflict with science.[87] Even in the case of Galileo, he insists upon non-doctrinal factors, rather than an innate hostility between science and religion, as the cause of Galileo's difficulties.[88] Instead of the familiar formula

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[80] Ibid., viii-xi.

[81] Ibid., viii-ix, 32, 55, 178.

[82] Ibid., 9, 77-80.

[83] Alexandre Koyre, *From Closed World to Infinite Universe*, (Baltimore: Johns Hopkins Press, 1957), 282-283, Foot note 19.

[84] Ibid., 98.

[85] Ibid., 5, 28-29.

[86] Arthur Koestler, *The Sleepwalkers*, (1959; New York: The Macmillan Comp., 1968), 444

[87] Ibid., 522-523.

[88] Ibid., 357-358, 425-426.

of initial Protestant animosity to the new science, Koestler characterizes the Protestant reaction as largely indifferent with only a few displays of hostility to the new science.[89] Furthermore, Copernicanism found safe haven among Catholic intellectuals.[90] Koestler presents a complex view of the nature of the Scientific Revolution.[91] He clearly rejects a simple continuity thesis.[92] Koestler settles on a position that is a hybrid of the continuity and Renaissance discontinuity positions.[93]

W. E. Knowles Middleton's brief overview *The Scientific Revolution* (1963), cites unnamed "heresies" as the reason for Bruno's execution.[94] He supports an anti-clerical analysis of the relationship between the new science and early modern religion. Middleton follows the well worn path by indicting the Protestants as the source of first resistance to Copernicanism.[95] Moreover, he argues that Protestantism and Catholicism were equally hostile to the new science.[96] As for the Catholics, Middleton declares that doctrine took precedence over any sort of free inquiry.[97] The major factor in the persecution of Galileo was the "honest but misguided belief that the Church was threatened by these new

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[89] Ibid., 166.

[90] Ibid., 213-214.

[91] Ibid., 513-520.

[92] Ibid., 79, 107-108, 218-219.

[93] Ibid., 112, 198-199, 205-212, 218-219.

[94] Middleton, 46.

[95] Ibid., 51.

[96] Ibid., 46-47.

[97] Ibid., 38.

ideas."[98] At various times, Middleton depicts the Scientific Revolution as essentially a case of Renaissance discontinuity.[99] Nevertheless, he includes considerable elements of continuity with the medieval tradition.[100] Middleton also makes reference to an abortive period of scientific growth in the twelfth century.[101]

F. P. Dickson's *The Bowl of Night* (1968) once again advances the unspecified charge of "heresy" as the reason for Bruno's execution.[102] Dickson notes that science and religion share a long history of antagonism. Nevertheless, he rejects the existence of innate hostility between the two forms of knowledge and characterizes any conflicts as the result of external, non-doctrinal factors.[103] Dickson indicates the existence of a sharp break between modern and medieval science.[104]

Patrick Moore's brief overview of the history of astronomy, *The Development of Astronomical Thought.* (1969), is the next work that attributes Bruno's execution to unnamed deviations from orthodoxy. Moore flatly denies that scientific ideas played any role at all in Bruno's execution.[105] Moore's work easily qualifies as anti-clerical for its depiction of the relationship between early

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[98] Ibid., 64.

[99] Ibid., 46, 48, 49, 51.

[100] Ibid., 46, 81.

[101] Ibid., 36-38.

[102] F. P. Dickson, *The Bowl of Night*, (Cambridge, Mass.: M. I. T. Press, 1968), 26.

[103] Ibid., 23.

[104] Ibid., 23-25

[105] Moore, 26.

modern science and religion. The Protestants raised the first objections to the new science, but the Catholic reaction against Copernicanism followed close behind.[106] Indeed, Moore claims, the Catholic Church had a long history of impeding science.[107] Moore contends that this opposition nearly squelched the development of modern science.[108] As for the Galileo case, Moore condemns the Church's response as irrational: "There was no science in the condemnation of Galileo, and neither was there any vestige of common sense."[109] He also connects resistance to the new science in the seventeenth century with allegiance to the Church.[110] Moore posits a sharp break between medieval and modern science.[111] Also, Moore indicates that the ancient Greek tradition inspired Copernicus.[112] Thus, Moore's work qualifies for inclusion in the Renaissance discontinuity category.

Hugh Kearney's *Science and Change 1500-1700* (1971), cites "dangerous opinions" as the reason for the Inquisition's violent action against Bruno.[113] Kearney casts doubt on Bruno's role in the development of modern science.[114] He also sees Hermeticism, and not rational analysis, as the motive for Bruno's

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[106] Ibid., 20-21.

[107] Ibid., 16.

[108] Ibid., 21-24.

[109] Ibid., 28.

[110] Ibid.

[111] Ibid., 16, 28-29.

[112] Ibid., 17.

[113] Hugh Kearney, *Science and Change 1500-1700*, (New York: The McGraw-Hill Book Comp., 1971), 148.

[114] Ibid., 108, 215.

adoption of Copernicanism.[115] The claim that adherence to a magical belief system led Bruno to the stake would remove him from consideration as a "martyr to science." In general, Kearney believes that none of the various subdivisions of Christianity were receptive to the new science.[116] Kearney holds a standard Renaissance discontinuity position.[117]

In the same year (1971), Colin Ronan's *Discovering the Universe* also promoted some form of unorthodox belief as the basis for Bruno's execution. He hints at other possible charges against Bruno; in particular, Ronan implies that Bruno's anti-Catholic sentiments may have been at issue. Ronan, however, refrains from making a direct link between such beliefs and Bruno's execution.[118] The Protestants occupy their usual place in Ronan's work as the first to object to the new science.[119] Bruno's connection between Copernicanism and anti-catholicism, Ronan contends, provoked the Catholic reaction against the new science in the seventeenth century.[120] Accordingly, Ronan's work falls into the anti-clerical category. Ronan tends toward a discontinuity view but indicates that the ancient Greek tradition inspired Copernicus.[121] As a result, Ronan's work loosely fits into the Renaissance discontinuity view.

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[115] Ibid., 106-107.

[116] Ibid., 101-105.

[117] Ibid., 9-16.

[118] Colin Ronan, *Discovering the Universe*, (New York: Basic Books, Inc., 1971), 39.

[119] Ibid., 37.

[120] Ibid., 39.

[121] Ibid., 34-36.

Bruno and Hermeticism

Bruno's execution, as the preceding analysis has shown, has been the subject of considerable debate. In particular, the alleged reasons for his condemnation vary widely. Among the numerous characterizations of Bruno's offenses is Frances Yates's contention that Bruno's went to the stake for his espousal of Hermeticism. Based on the group of writings known as the *Hermetic Corpus*, the Hermetic philosophy was a Hellenistic creation, dating from the second century A.D., but purportedly the work of an ancient Egyptian magician, Hermes Trismegisthus. According to the account that gained wide circulation in the early modern period, the works of Hermes Trismegisthus contained numerous magical spells and incantations that would grant the user considerable power.[122] Francis Yates classic work *Giordano Bruno and the Hermetic Tradition*, portrays Bruno as a magician in the Hermetic tradition who attempted to promote Hermetic philosophy as an alternative to both Catholicism and Protestantism.[123]

Since 1964, when Yates published the book, a number of historians have adopted Yates's contention that Bruno died as a result of his Hermetic or other magical philosophies. For example, Allan Debus's *Man and Nature in the Renaissance* (1978), argues that Bruno's magical beliefs were his main offense.[124] Debus takes a neutralist stance regarding the Catholic reaction to Copernicanism.

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[122] Yates, *Hermetic Tradition*, 1-19. Isaac Casaubon, in 1614, demonstrated that the Hermetic writings originated in the Hellentistic era. See Yates, *Hermetic Tradition*, 170, 398-403.

[123] Ibid., 450-451.

[124] Debus, 87.

The Catholic hostility was slow and only in response to the upheavals and threats of the Reformation. Protestants, once again, displayed, according to Debus, the first objection to the new science on Scriptural grounds.[125] Debus, as the title of his book indicates, holds a Renaissance discontinuity view.[126]

By the time that A. Rupert Hall published his *The Revolution in Science 1500-1750* in 1983, the status of Bruno as a Hermetic magician had apparently become a widespread thesis.[127] Hall adopts an essentially anti-clerical view of the relations between early modern science and religion. He names both Protestants and Catholics as opponents of Copernicanism but indicates that the Catholic Church was the more oppressive of the two branches of Western Christianity. Hall softens his anti-clerical stance, however, by arguing that the opposition was relatively mild and often included issues that were peripheral to science.[128] On the nature of the Scientific Revolution, Hall adopts a clear Renaissance discontinuity position.[129]

Margaret Jacob, in *The Cultural Meaning of the Scientific Revolution* (1988), explicitly tie Bruno's death to his advocacy of Hermeticism.[130] Jacob denies that any "martyrs to science" ever existed.[131] Even in the Galileo case,

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[125] Ibid., 96-98.

[126] Ibid., 2, 4-5, 7, 79.

[127] Hall, 118.

[128] Ibid., 95-96, 121.

[129] Ibid., 30-31, 36.

[130] Margaret Jacob, *The Cultural Meaning of the Scientific Revolution*, (Philadelphia: Temple Univ. Press, 1988), 26-28.

[131] Ibid., 4-5.

Jacob further removes the possibility of an inherent state of hostility between religion and science. Specifically, she argues that the Reformation provoked a backlash by the Catholics against anything that seemed even remotely threatening. Galileo's ideas, which might have been acceptable in other circumstances, were simply too provacative for the conflict-ridden Reformation era and thus incited a strong reaction from the Catholic religious authorities.[132] Accordingly, she adopts a neutralist position regarding the science and religion relationship. The absence of an external conflict may have even, she indicates, allowed for the peaceful coexistence of the new science with both Protestantism and Catholicism.[133] Jacob offers little in the way of analysis of the nature of the Scientific Revolution. She hints at a discontinuity position but largely avoids a discussion of the subject.[134]

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[132] Ibid., 12-14.

[133] Ibid., 17.

[134] Ibid., 3-4, 16.

Works That Ignore Bruno or His Fate

Works That Exclude Bruno's Fate

The final group of works to be considered either omit a discussion of Bruno or do not consider his fate. In contrast to the rather stable structures that appeared in Chapter Two and and the first part of Chapter Three, the works in this final section display a wide variety of interpretive patterns. E. A. Burtt's *The Metaphysical Foundations of Modern Physical Science* (1925), provides an excellent example of the variations that occur when Bruno no longer plays a leading role in the analysis. After noting Bruno as a supporter of Copernicus, Burtt completely ignores his fate.[135] He then characterizes the hostility toward the new science in the early modern period as a scientific rather than a religious debate. On the question of the origins of modern science, however, Burtt displays a distinct discontinuity position. In particular, Burtt describes the scientific revolution as a rather abrupt conceptual shift. Indeed, Burtt goes so far as to suggest that the modern and medieval traditions are incommensurable.[136]

Charles Singer's *From Magic to Science* (1958) loosely fits into this category. Singer notes Bruno's death but draws no conclusions on the reasons for it.[137] Singer likewise ignores the science and religion relationship. He does, however, elaborate on the nature of the Scientific Revolution. Singer, while

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[135] Burtt, 53-56.

[136] Ibid., 39-41.

[137] Charles Singer, *From Magic to Science*, (New York: Dover Publications, 1958), 109.

admiting some vague connections between medieval and modern science, considers Copernicus and Vesalius as inaugurating the modern intellectual tradition.[138]

Francis R. Johnson's, *Astronomical Thought in Renaissance England* (1937), rejects Bruno as a truly scientific thinker. In Johnson's view, Bruno was a rather superficial Copernican who used heliocentrism to bolster his mystical theology. Despite this notice of Bruno, Johnson makes no mention of his execution.[139] Regarding the science and religion relationship, Johnson indicates that, at least in the case of the Catholics, early modern religion displayed considerable flexibility in adapting to the new science.[140] Although Johnson makes no specific claims on the nature of the Scientific Revolution, he seems to be advocating a continuity position. In Johnson's view, Copernicus's work was part of a much larger process of development that extended back into the middle ages.[141]

Two years later, Humphrey Thomas Pledge's *Science Since 1500* (1939), largely repeats Johnson's formula. Specifically, Pledge discusses Bruno but makes no mention of his death.[142] In a revealing passage, however, Pledge rejects the contention that advocacy of science was ever sufficient to provoke persecution

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[138] Ibid., 62-63.

[139] Johnson, 168.

[140] Ibid., 94-95, 114-116.

[141] Ibid., 7-8, 61-65.

[142] Pledge, 36, 57, 91, 94, 296.

by the religious authorities.[143] He seems to indicate that early modern religion and science initially enjoyed a amicable relationship. Eventually, however, the religious conflict of the seventeenth century generated hostility between the types of knowledge.[144] Finally, Pledge adopts continuity as his basic position on the historical development of science.[145]

Eduard Dijksterhuis's *The Mechanization of the World Picture* (1950) represents a typical example of the works under consideration. After a brief mention of Bruno's ideas, Dijksterhuis dismisses him as peripheral to the history of science.[146] No mention of Bruno's death appears in Dijksterhuis's book. Dijksterhuis asserts a basically anti-clerical position, though he seems to believe that proponents of the new science had little to fear from ecclesistical opposition. Defenders of Copernicus only encountered problems if they, like Galileo, challenged the religious authorities too directly.[147] Dijksterhuis indicates some elements of continuity as well as hinting at a Renaissance discontinuity position.[148] Overall, he inclines more strongly toward a simple discontinuity view.[149]

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[143] Ibid., 54.

[144] Ibid., 37-38.

[145] Ibid., 13.

[146] Eduard Jan Dijksterhuis, *The Mechanization of the World Picture*, (1950; New York: Clarendon Press, 1964), 232.

[147] Ibid., 297, 383-385.

[148] Ibid., 223-225.

[149] Ibid., 277, 287-288, 298.

Stephen F. Mason's *A History of the Sciences* (1953) is, in its original edition, the next work in this section. As in the other works, Mason explores some of Bruno's ideas but makes no mention of his death.[150] Mason indicates the presence of some early Protestant hostility towards science. Nevertheless, he devotes a considerable amount of energy to demonstrating that science and Protestantism enjoyed an essentially harmonious relationship.[151] The emphasis on the Protestant-science relationship seems to imply a degree of Catholic hostility toward science. A hint of Catholic antagonism toward science appears in the discussion of Galileo.[152] Since Mason does not explicitly posit any inherent hostility, however, his exact attitude regarding the Catholic-science relationship is not clear. Finally, Mason views early modern science as the end product of an extensive historical development that stretches back into the middle ages.[153] On the other hand, his work also contains elements that hint at a Renaissance discontinuity view.[154]

At the same time that Mason's revised work appeared, William Wightman produced *Science and the Renaissance* (1962). Wightman fits this category rather awkwardly. Properly speaking, Wightman does not ignore Bruno's fate. He simply refuses to come to any conclusions about the rationale behind Bruno's

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[150] Stephen F. Mason, *A History of the Sciences*, rev. ed., (1953; New York: Collier Books, 1962), 189, 220, 298.

[151] Ibid., 175-179.

[152] Ibid., 160-161.

[153] Ibid., 103-123.

[154] Ibid., 121-123, 127, 130.

execution.[155] Overall, Wightman assumes a neutralist view on the science and religion relationship. His presents a mixed characterization of the Protestant reaction the new science. Although some Protestants announced the first opposition to Copernicanism, others played crucial roles in promoting heliocentrism.[156] Wightman also promotes a favorable view of the Catholic reaction to heliocentrism.[157] Ultimately, Wightman rejects any innate hostility between science and religion.[158] Deciphering Wightman's views on the nature of the Scientific Revolution requires more effort, however. Wightman opens his book with an attack on the concept of the Renaissance as time of renewed intellectual activity.[159] Despite these protestations, Wightman eventually enunciates a Renaissance discontinuity view.[160]

Works That Ignore Bruno

Walter Libby's, *An Introduction to the History of Science* (1917), represents the first work under consideration that excludes an examination of Bruno. Libby's book asserts a strong anti-clerical position on the science and religion

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[155] William P. D. Wightman, *Science and the Renaissance*, 2 vols., (New York: Hafner Pub. Comp., 1962), 1:43-44.

[156] Ibid.,1:42, 44.

[157] Ibid.

[158] Ibid., 1:116.

[159] Ibid., 1:1-7.

[160] Ibid., 1:9, 12-13, 109, 116.

relationship.[161] He accepts at face value the existence that early modern religion was intolerant towards science.[162] In sharp contrast to the discontinuity view that usually follows the pronouncement of an anti-clerical view,[163] Libby espouses a strong continuity view on the development of science.[164]

Fourteen years later, R. J. Harvey-Gibson published his *Two Thousand Years of Science* (1931). Harvey-Gibson also omits all discussion of Bruno. He also directs little attention to the relationship between science and religion. The Church's reaction against Galileo does receives a brief overview that contains little analysis.[165] The only direct claim about the science and religion relationship exists in the statement that seventeenth century religious authorities regarded some types of geological speculations as provocative.[166] Otherwise, Harvey-Gibson gives no indication of the presence of either hostility or acceptance. He is somewhat clearer about the nature of the scientific revolution, however. According to Harvey-Gibson, the emergence of early modern science represented a sharp discontinuity with the medieval tradition.[167]

Dispensing with any consideration of Bruno, Herbert Douglas Anthony's, *Science and Its Background* (1948), seems to adopt an anti-clerical view. He argues that both Catholics and Lutherans clashed with the new science. On the

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[161] Walter Libby, *An Introduction to the History of Science*, (Boston: Houghton Mifflin Comp., 1917), 47.

[162] Ibid., 56.

[163] See Chapter 2.

[164] Ibid., 43-44, 55-57.

[165] Harvey-Gibson, 32.

[166] Ibid., 39.

[167] Ibid., 12, 24.

other hand, he also pleads for an understanding of the conflict in its proper historical context.[168] Such a position usually indicates a neutral or even a pro-clerical attitude. Overall, elements of Renaissance discontinuity temper Anthony's otherwise absolute discontinuity view.[169]

F. Sherwood Taylor's, *Short History of Science* (1949), also omits a discussion of Bruno. Taylor confines himself solely to the relationship between the Catholic Church and early modern science. On the whole, he espouses a neutralist position on the alleged conflict between science and religion. Taylor attributes much of friction between supporters of the new science and the religious authorities to a struggle over the validity of Aristotelianism rather than over purely religious doctrines. With the exception of Galileo, no one, Taylor contends, ever suffered persecution for adherence to the new science.[170] Taylor possesses a generally favorable view of the medieval intellectual tradition but nevertheless settles on a Renaissance discontinuity view.[171]

More than thirty years later, Frank Durham and Robert D. Purrington's *Frame of the Universe* (1983), remains silent on Bruno. They make the common observation that the Protestants registered the first complaints against the supposed unorthodoxy of the new science.[172] Their description of the Catholic reaction tends toward a neutralist view despite the presence of some elements that

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[168] H. D. Anthony, *Science and its Background*, 2nd. ed., (1948; London: Macmillan and Comp., 1954), 134.

[169] Ibid., 145, 158-159.

[170] F. Sherwood Taylor, *Short History of Science*, (New York: Norton, 1949), 60, 109, 113.

[171] Ibid., 71-72.

[172] Frank Durham and Robert D. Purrington, *Frame of the Universe*, (New York: Columbia Univ. Press, 1983), 97-98.

usually accompany the anti-clerical position.[173] Similarly, Durham and Purrington's judgment on the nature of the Scientific Revolution appears complex but ultimately boils down to a Renaissance discontinuity outlook.[174]

Conclusion

As the preceding chapter has shown, the anti-martyr to science interpretive scheme tends away from the sharp discontinuity and anti-clerical positions that characterized the works in Chapter Two. Broadly speaking, works that reject the title of "martyr to science" for Bruno tend to support continuity between medieval and modern science and lean toward a more hospitable portrayal of the relationship between science and religion. The removal, however, of Bruno's image as a victim of an oppressive and intolerant Church tends to weaken the logical connections between the elements of the interpretive scheme. Consequently, the works that the third chapter examined displayed a much greater degree of deviation from the ideal "anti-martyr to science" scheme. Advocates of discontinuity and anti-clericalism can thus appear without contradiction among works that fall into the "anti-martyr to science" scheme. Indeed, the presence of such deviations actually strengthens the basic premise of this thesis that the characterization of the reasons for Giordano Bruno's execution at the hands of the Inquisition supplies the basis for historical interpretations of

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[173] Ibid., 98, 130-136.

[174] Ibid., 83-86, 93-95, 126.

the early modern period of science. Regardless of the deviations from an ideal anti-martyr to science scheme, works that portray Bruno as a martyr to science produce, in general, a quite different image of the history of early modern science than works that reject the image of Bruno as a victim of anti-scientific persecution.

Conclusion

As the preceding argument has shown, the image of Giordano Bruno plays a crucial role in the history of science. In general, the stated reason for Bruno's execution correlates with particular claims both about the relationship between science and religion and about the nature of the Scientific Revolution. Histories of science that attribute Bruno's execution to his acceptance of allegedly proscribed scientific doctrines, and hence cast Bruno in the role of "martyr to science", tend to portray religion as hostile to science. Such works, moreover, generally regard the transition between medieval and modern science as discontinuous. The alternative scheme of interpretation inverts this formula. A denial, or omission, of Bruno's supposed status as a "martyr to science" often accompanies a rejection of an inevitable, inherent conflict between science and religion. These works also tend to support less revolutionary and more continuous views of the emergence of modern science. Despite some deviations from these ideal patterns, the two interpretive schemes possess a remarkable

degree of stability. As a result of this stability, the "martyr to science" and the "anti-martyr to science" schemes are readily distinguishable from each other.

The distinctiveness of the two schemes does not, however, entail the division of the history of science into two rigid interpretive camps. A more accurate view of the history of science would recognize the two interpretive schemes as the poles of a spectrum. Individual historical works, of course, fall across the entire range of interpretations. Each work also displays a tendency towards one of the two extremes. This tendency defines the membership of a particular work in either the "martyr to science" or "anti-martyr to science" interpretive scheme.

Three broad issues emerge from an examination of Bruno's image in the history of science. Specifically, the origins, the stability, and the persistence of the two interpretive schemes all demand explanation. An attack on these problems can proceed from two vantage points. On the one hand, clues to these questions may arise from a comparative examination of the texts' internal explanatory structures. This thesis employs such an internalist methodology. An alternative method would seek the answers to the questions that the examination of Bruno has raised in the external, social context the surrounds, supports and permeates the text.

A full explanation of the origins, stability, and persistence of the two interpretive schemes would, ideally, synthesize both the internal and external aspects of the texts. This thesis, however, strives only to prepare the way for such an analysis by mapping out the internal dynamics of the history of science. An

understanding of the interpretive structures that characterize the history of science, creates a foundation for the far more challenging task of linking the internal structure of the text to its external context. Accordingly, providing a description of the interpretive patterns that historians of sciences have used in their analyses represents a complete project in itself. Nevertheless, a brief survey of the limitations of the internalist approach will indicate the role of the external viewpoint in answering the issues that arise from an examination of Bruno's image in the history of science.

Delineating the structure of a text provides little insight into the origins of the two interpretive schemes. Since no document exists that unambiguously names the charges against Bruno, the texts cannot contain a concrete proof either for or against the claim for Bruno's status as a "martyr to science". When a text makes a claim about the cause of Bruno's death, that claim is inevitably a collage of clues and hints that historians assemble in the light of their preconceptions about the early modern period. In the absence of positive evidence that resides in the texts, judgments about the origins of the various claims for Bruno's status must rest on sources that are external to the text.

The "anti-martyr to science" claims also requires an external examination. Although the "anti-martyr to science" scheme often takes the form of a self-conscious reaction to the "martyr to science" scheme, the relationship between the the two sets of interpretations is not a case of one interpretation arising from or superseding an earlier interpretation. The historical relationship between the two schemes rules out such conclusion. For at least the last 150

years, both schemes have appeared side by side in the literature. Clearly, a consideration of the texts alone will not suffice to explain the origins of either interpretive scheme.

Internal explanations perform best in explaining the phenomenal stability of both schemes. As this entire thesis has indicated, both schemes possess a tight and compelling logical structure. Logic, however, does not appear to be the only reason for the stability of the two schemes. A sharp difference in tone differentiates "martyr to science" school of thought from its opposition. Specifically, the "martyr to science" interpretation tends toward a compact style of argumentation that, under the appropriate circumstances, might enhance the stability of the argument. The "anti-martyr to science" more inclusive approach, in contrast, would seem to lead to instability. Yet, the " anti-martyr to science" school displays a remarkable degree of logical coherence. In both cases, contextual factors are making a significant contribution to the stability of the interpretive structure.

Finally, the issue of the persistence of two opposed interpretive schemes over a considerable period of time requires an almost wholly external approach. The main reason for such a claim arises from the previous characterization of the two schemes. A "martyr to science" approach tends to generate a simple, formulaic explanation. Conversely, the "anti-martyr to science" scheme generally employs multi-causal arguments that present a much more complex picture of the early modern period. At an intuitive level, the "anti-martyr to science" scheme seems more appealing. This view of history would appear to generate a fuller,

and hence, more accurate depiction of historical events. After all, the precise nature of Bruno's offense is unknown. Moreover, Bruno clearly engaged in a wide range of activities that could have easily provoked the Church's wrath. An easy conclusion to draw from these two points is that Bruno's execution could not have been solely the result of his adherence to Copernicanism. Indeed, considering the sheer number of his possible offenses, Copernicanism might well have been insignificant in determining Bruno's fate. The context in which Bruno expounded his ideas further reduces the role of Copernicanism in his execution. Specifically, vocal supporters of unorthodox religious and anti-Catholic views would probably not have fared well in an era when the Catholic Church found itself being effectively challenged on fundamental points of religious doctrine. The Church, under such a threat, would clearly have an interest in restraining outspoken and threatening individuals. Copernicanism might have been among the doctrines that the Church found threatening and thus some individuals might have faced persecution for such beliefs. Nevertheless, since the challenge to the Church took the form primarily of a struggle over religion, Bruno's deviance in religious matters probably took precedence in determining his fate over his unorthodox ideas in natural philosophy.

In contrast to this sort of explanation, the "martyr to science" scheme appears absurdly simple. The "martyr to science" accounts select one strand, heliocentrism, out of Bruno's convoluted and complex body of writings. Then, this doctrine becomes the specific focus of attack by early modern religion in general, and of repression by the Catholic Church in particular, solely on the

grounds of doctrinal conflict. Virtually absent is any discussion of the context in which this alleged conflict occurred. Advocates of the "anti-martyr to science" scheme will almost certainly reject the "martyr to science" explanation as far too simplistic. Unfortunately for the "anti-martyr to science" supporters, simplicity of explanation is not in itself grounds for rejecting the "martyr to science" scheme. Indeed, simplicity may represent a virtue in explanation. The "martyr to science" scheme delivers a logical, coherent explanation of the relationships between a particular individual, early modern religious institutions, and the process of historical change and does so by invoking far fewer causal factors than is the case with the "anti-martyr to science" scheme. On the basis of efficiency of explanation, the "martyr to science" scheme emerges as clearly superior to the alternative.

As a result, the choice between the two interpretive schemes rests on criteria of explanation that are prior to the schemes themselves. If one holds complexity of explanation as a preeminent value, then the "anti-martyr to science" scheme will be most attractive. A desire for efficiency and simplicity will yield the opposite choice. In the absence of concrete evidence about the reason for Bruno's execution, these internal criteria will guide the choice of interpretive scheme. Since the interpretive schemes themselves provide no objective means of choosing either complexity or simplicity as the correct approach to the Bruno case, the preference for one view over another must reside in a source that is external to the texts. An appeal to external factors is, therefore, almost certainly the only

way to resolve the issue of the enduring persistence of the two interpretive schemes.

If nothing else, this discussion has revealed the complexity of the historiography of science. Far from simple tales of progress, historical studies of science lie at the nexus of a host of assumptions and influences. Consequently, despite a placid surface, the historical accounts of early modern science are rife with conflict and dissent. Indeed, extensive reading in the literature reveals that no two accounts are exactly the same. As the case of Bruno demonstrates, an awareness of the assumptions that underlie historical accounts is as important to historical research as is a firm grasp of the so-called facts of history.

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