Introduction

To facilitate the independent reading, interpretation, and critical evaluation of the documents collected in the body of this work, this Introduction provides an elementary overview of the events and issues of the Galileo affair, together with some of its historical background and a sketch of a philosophical approach to its study. By the "Galileo affair"[1] is meant the sequence of developments which began in 1613 and culminated with the trial and condemnation of Galileo Galilei by the Roman Catholic Inquisition in 1633. Galileo Galilei is the Italian scientist and philosopher whose contributions to astronomy, physics, and scientific instrumentation and methodology in general were so numerous and crucial that, of the several founders of modern science, he is usually singled out as the "Father of Modern Science." The approach to be sketched here is philosophical in a double sense. First (section 1), the study of the affair is motivated for the light it may shed on a number of general cultural and interdisciplinary problems that have their own intrinsic theoretical interest—for example, the problem of the nature of science and how it relates to other human activities such as religion and politics. Second (section 2), a framework of general and conceptual distinctions is provided to enable the student and the scholar to avoid a number of pitfalls, while at the same time giving them the widest possible freedom to arrive at their own interpretation and evaluation.[2] The historical background consists primarily of two bodies of information, one pertaining to nonintellectual factors (section 3), the other involving a set of arguments which for centuries had convinced scientists and phi-

losophers that the earth must be standing still at the center of the universe (section 4). Finally, the overview focuses on the earlier and the later phases of the affair (sections 6 and 7), but includes an account of how Galileo became involved in it (section 5) and a discussion of its aftermath (section 8).

1. THE SCIENCE-RELIGION CONTROVERSY AND OTHER PROBLEMS

The question of the relationship between science and religion is one of the most basic and persistent problems in interdisciplinary thinking and general culture. It may also be regarded as a key philosophical problem, if we take philosophy to be centrally concerned with the critical understanding of human experience; that is, if we take philosophy not as a technical discipline which studies its own special topics and problems, but rather as a way of thinking that has been applied throughout the ages to the study of the most diverse subject matter originating from other disciplines or from human life in general. The controversy ranks with such problems as those of the relationship between science and the humanities, between science and literature, between science and art, as well as the problems of the relationship between religion and morality, between morality and politics, and between politics and economics.

The problem could be formulated in terms of questions like the following. Are science and religion compatible, incompatible, mutually reinforcing, mutually indifferent, or incommensurable? Are they perhaps complex entities which exhibit different relationships at different times and in different contexts? Can a church impose any restrictions on the freedom of scientific investigation of its adherents? Is theology the queen of the sciences? Can theology be scientific, or is it intrinsically nonscientific? Can science provide any information about the nature of ultimate reality and the meaning of life, or are such questions necessarily the province of religion? What is the role of faith in science and in religion? Is it something essential to religion but foreign to science, or is it essential to both? What is the role of authority in science and in religion? Again, is authority the essence of religion but incompatible with science? Are there different kinds of faith and authority, each appropriate to one but not to the other? What is the role of values in science and in religion? Do they have a different role in each, or are they

a common element of both? Is science itself a religion? That is, does science, or do certain attitudes toward science, have a religious component? Does science promote secular humanism, and is secular humanism a religion? What is the proper relationship between scientific and religious beliefs? Is it ever proper to accept or reject scientific theories on the basis of religious belief? Can one ever prove or disprove religious beliefs scientifically? What is the proper attitude toward scientific knowledge in the light of religious beliefs, and toward religious beliefs in the light of scientific knowledge?

One way to come to grips with this problem is to follow a historical approach by examining various episodes that involve the interaction between science and religion to see what lessons if any may be derived from them. One of the most instructive and fascinating of these historical episodes is, of course, the Galileo affair. It is certainly not the only episode that can shed light (and heat) on the science–religion controversy. That the problem is not unique to Catholicism may be seen from Protestant reactions to Charles Darwin's theory of evolution in nineteenth-century England and from the persistent Fundamentalist uneasiness about evolution in twentieth-century America. The problem is not even restricted to revealed, supernatural religions such as Christianity; episodes like the Lysenko affair in the Soviet Union suggest that secular religions are not contradictions in terms and that modern totalitarian societies are counterparts of the older, traditional religions.

Nevertheless, the Galileo affair remains the cause célèbre par excellence for reflecting on the science-religion relationship. This is so in part because the incident was the first to illustrate the problem as it exists today, in the sense that the facts of the case do indeed show all the external signs of a clash between a symbol of science and a symbol of religion. And in part its classic relevance to the same problem is due to the impression which the trial of Galileo made on subsequent history. In fact, the most common interpretation of the event continues to be cast in terms of what it shows about the relationship between science and religion;[3] and here we have such an overwhelming abundance of perceptions that they acquire the strength of a material force and must be dealt with, even if they should be ultimately incorrect.

The Galileo affair can also be studied in other ways, reflecting the viewpoint of problems and issues that are distinct from the science–religion question. For example, since Galileo's contributions were such as to earn him the label of Father of Modern Science, it is obvious that one may see the event as a microcosm of the Scientific Revolution itself

and scientific investigation in general and therefore study it primarily for what it tells us about the nature of scientific knowledge per se and how it develops.[4] One may then try to derive lessons about such issues as the relative importance of facts, theories, and instruments; the difference between observation and experimentation; the role of quantitative analysis, causal inquiry, hypotheses, and authority in science; the rationality of replacing one scientific theory by another; and so on. The focus on this aspect of the Galileo affair may be called the *epistemological* approach, if epistemology is defined as the study of the nature of knowledge and how it develops.

Others like to focus on the fact that in the historical context in which Galileo found himself, the Catholic church was not merely a religious institution but performed an important political function and social role. They then stress that it was the sociopolitical side of the Church which interfered with Galileo, and thus they see the episode as illustrative of the interaction between science and society, the problem of the social control of science, the conflict between scientific truth and political expediency, and so on.[5]

The Galileo affair is also a classic example of controversy in a double sense: first, it was itself an episode of controversy involving scientific, epistemological, philosophical, theological, religious, social, and political issues; and second, it has always generated controversial historical interpretations and critical evaluations—so much so that relevant accounts can often give us insight into the historical conditions and philosophical presuppositions of the corresponding authors and times. Thus the Galileo affair can be studied for what it tells us about the nature of controversy as such and it can be compared with other controversies, whether they be the Pelagian controversy in fifth-century Christianity or the Spasmodic controversy in nineteenth-century English literature.

Finally, the Galileo affair is a human tragedy of universal significance, and thus some have attempted to portray it as human drama; that is, the episode illustrates the interaction among such elements as vanity, friendship, betrayal, compromise, loyalty, piety, courage, sacrifice, humiliation, and duty. The most famous of these portrayals is perhaps Bertolt Brecht's play *Galileo*.

These aspects of the affair, and the consequent orientations in studying it, are not mutually exclusive, but rather interrelated and somewhat overlapping. For example, a full understanding of the nature of scientific knowledge would require understanding its relationship to other important human activities and institutions such as religion, politics, so-

ciety, and controversy; therefore, the epistemological approach could be taken as encompassing all the others. Nevertheless, the various orientations should not be *confused* with each other; nor can it be denied that the science–religion dimension is the most striking one at first.

All of this perspective is essential, but it is not yet sufficient. We need two other signposts in order not to lose our bearings. One of these involves a pair of critical interpretations that are opposite extremes and must be avoided; the other involves a set of distinctions which provide merely the framework for various critical interpretations, but which need to be applied for a proper account of the episode.

2. THE ANTI-CATHOLIC AND ANTI-GALILEAN EXTREMES AND OTHER DISTINCTIONS

Villa Medici in Rome is one of the most impressive palaces in the city. Its name derives from the fact that for a long time it was the embassy of the Grand Duchy of Tuscany, which was ruled by the House of Medici. After receiving in 1610 the title of "Philosopher and Chief Mathematician to the Most Serene Grand Duke of Tuscany," Galileo normally resided there during his visits to Rome. His last stay at the villa was, however, rather unfortunate: it was in fact the period during which his trial of 1633 was taking place. Galileo's visit on that particular occasion thus had the status of imprisonment, a privileged imprisonment to be sure, but a forced residence nonetheless, as I shall relate below.[6] Next to the building, at the edge of the street, stands a commemorative column, erected at the end of the nineteenth century, which says expressly that "it was here that Galileo was kept prisoner by the Holy Office, being guilty of having seen that the earth moves around the sun." The historical and cultural importance of this lesser tourist attraction is that it expresses one of the most common myths widely held about the Galileo affair, namely that he was condemned by the Catholic church for having discovered the truth. Now, since to condemn a person for such a reason can only be the result of ignorance and narrow-mindedness, this is also the myth which is used to justify the incompatibility between science and religion.

The fact that I have described this interpretation of the affair as a myth reveals part of my attitude. In fact, I believe that such a thesis is erroneous, misleading, and simplistic. Nevertheless, this myth continues to circulate. For example, a formulation of the myth, not much more

sophisticated than the one on the Villa Medici column, can be found in Albert Einstein's foreword to the standard English translation of Galileo's *Dialogue*.[7]

The reason for identifying this first anti-Catholic myth about the Galileo affair is that it may be usefully contrasted to a second myth at the opposite extreme. It seems that some found it appropriate to fight a disagreeable myth by constructing another one. The anti-Galilean myth maintains that Galileo deserved condemnation because his 1632 book violated not only various ecclesiastical norms but also various rules of scientific methodology and logical reasoning; he is thus portrayed as a master of cunning and knavery, and it is in fact difficult to find a misdeed of which the proponents of this myth have not accused him. The history of this myth too has its own fascination, and it too includes illustrious names, such as Arthur Koestler (author of *The Sleepwalkers*) and French physicist, philosopher, and historian Pierre Duhem.[8]

These two opposite myths are useful as reference points in order to orient oneself in the study of the controversy, since it is impossible to evaluate the affair adequately unless one admits that both of these interpretations are mythological and thus rejects both. Avoiding them is easier said than done, however; for example, one cannot simply follow a mechanical approach of mediating a compromise by dividing in half the difference that separates them. A helpful way of proceeding is to read the relevant texts with care and with an awareness of a number of important conceptual distinctions.

One of the most important points to keep in mind is that the Galileo affair involved both questions about the truth of nature and the nature of truth, to use Owen Gingerich's eloquent expression.[9] That is, the controversy was at least two-sided: it involved *scientific issues* about physical facts, natural phenomena, and astronomical and cosmological matters; and it also involved methodological and *epistemological questions* about what truth is and the proper way to search for it, and about what knowledge is and how to acquire it.

The overarching scientific issue was whether the earth stands still at the center of the universe, with all the heavenly bodies revolving around it, or whether the earth is itself a heavenly body that rotates on its axis every day and revolves around the sun once a year. There were several distinct but interrelated questions here. One was whether the whole universe revolves daily from east to west around a motionless earth, or whether the earth rotates daily on its axis in the opposite direction (west to east); this was the problem of whether the so-called *diurnal motion*

belongs to the earth or to the rest of the universe. Another question was whether the sun revolves yearly from west to east around the earth, or whether the earth revolves in the same way around the sun; this was the issue of whether the so-called *annual motion* belongs to the sun or to the earth. Another aspect of the controversy was whether the center of the universe, or at least the center of the revolutions of the planets, is the earth or the sun. And there was also the problem of whether or not the universe is divided into two very different regions, containing bodies made of different elements, having different properties, and moving and behaving in different ways: the terrestrial or sublunary part where the earth, including water and air, are located; and the celestial, heavenly, or superlunary region, beginning at the moon and extending beyond to include the sun, planets, and fixed stars.

The traditional view may be labeled *geostatic*, insofar as it claims the earth to be motionless; or *geocentric*, insofar as it locates the earth at the center of the universe; or *Ptolemaic*, insofar as in the second century A.D. the Greek astronomer Ptolemy had elaborated it in sufficient detail to make it a workable theoretical system; or *Aristotelian*, insofar as it corresponded to the worldview advanced in the fourth century B.C. by the Greek philosopher Aristotle, whose ideas in a wide variety of fields had become predominant in the sixteenth century; or *Peripatetic*, insofar as this was a nickname given to followers of Aristotle. The other view may be called either *geokinetic*, insofar as it holds the earth to be in motion; or *heliocentric*, insofar as it places the sun at the center; or *Copernican*, named after the Polish astronomer Nicolaus Copernicus who in the first half of the sixteenth century elaborated its details into a workable theoretical system; or *Pythagorean*, named after the ancient Greek pre-Socratic Pythagoras, one of the earliest thinkers (sixth century B.C) to advance the idea in a general way. We may thus say that the scientific issue was essentially whether the geostatic or the geokinetic theory is true, or at least whether one or the other is more likely to be true.

The epistemological issues were several. There was the question of whether or not physical truth has to be directly observable, or whether any significant phenomenon (for example, the earth's motion) can be true even though our senses cannot detect it, but can detect only its effects; here, one should remember that even today the earth's motion cannot be seen directly by an observer on earth. Then there was the question of whether artificial instruments like the telescope have any legitimate role in the search for truth, or whether the proper way to

proceed is to use only the natural senses; here, it should be mentioned that the telescope was the first artificial instrument ever used to learn new truths about the world. A third issue of this sort involved the question of the role of the Bible in scientific inquiry, whether its assertions about natural phenomena have any authority, or whether the search for truth about nature ought to be conducted completely independently of the claims mentioned in the Bible; in this regard it should be noted that it was widely believed that the new geokinetic theory contradicted the Bible. Fourth, there was the question of the epistemological status of the science of astronomy, its relationship to physics, and whether the hierarchy between these two sciences is such that cases of conflict between the two are to be resolved necessarily by letting physics prevail over astronomy; this problem arose because, as we shall see, the earth's motion contradicted the physics of the time. Let us call these four central issues, respectively, the problems of the observability of truth, the legitimacy of artificial instruments, the scientific authority of the Bible, and interdisciplinary hierarchy.

For the second conceptual clarification one needs to distinguish between *factual correctness* and *rational correctness*, that is, between being right about the truth of the matter and having the right reasons for believing the truth. Suppose we begin by asking who was right about the scientific issue. It is obvious that Galileo was right and his opponents wrong, since he preferred the geokinetic to the geostatic view, and today we know for a fact that the earth does move and is not standing still at the center of the universe. However, it is equally clear that his being right about this matter does not *necessarily* mean that his motivating reasons were correct, since it is conceivable that although he might have chanced to hit upon the truth, his supporting arguments may have been unsatisfactory. Hence, the evaluation of his arguments is a separate issue.

I am not saying that the various proponents of the anti-Galilean interpretation[10] are right when they try to show that his arguments left much to be desired, ranging from inconclusive to weak to fallacious to sophistical. In fact, this evaluation is in my opinion untenable, and I think I have adequately shown elsewhere that, when accurately reconstructed, Galileo's arguments are largely correct.[11] Rather, I am saying that Galileo's critics have raised a distinct and important issue *about* the Galileo affair—namely, whether or not, or to what extent, his *reasoning* was correct.

The next point that must be appreciated is also easy when stated in

general terms but extremely difficult to apply in practice. It is that *essential correctness* must not be equated with either *total correctness* or *perfect conclusiveness*. Applied to our case, this means that even if Galileo's arguments were essentially correct, as I would hold, the possibility must be allowed that the reasoning of his opponents was neither worthless, nor irrelevant, nor completely unsound. This point is a consequence of the fact that we are dealing with nonapodictic arguments which are not completely conclusive but rather susceptible of degrees of rational correctness, and so it is entirely conceivable that there should sometimes be equally good arguments in support of opposite sides, as well as that the arguments for one side should be better than those for the opposite, without the latter being worthless. I believe this is the case for the Galileo affair, though the anti-Catholic critics do not seem to be able to understand this point. The proper antidote here is the study of the details of the relevant arguments.

To appreciate the next distinction, let us ask whether Galileo or the Church was right in regard to the epistemological aspect of the controversy. Since epistemological issues are normally more controversial than scientific ones, this is an area that some like to exploit by trying to argue that the Church's epistemological and philosophical insight was superior to Galileo's.[12] The argument is usually made in the context of a frank and explicit admission that Galileo was unquestionably right on the scientific issue. Thus, these anti-Galilean critics could be said to show evenhandedness and balanced judgment by contending that on the one hand Galileo was right from a scientific and factual point of view, but that on the other hand the Church was right from an epistemological or philosophical point of view. However, such interpretations could also be criticized for their exaggeration and one-sidedness in the analysis of the epistemological component of the affair. That is, I have already mentioned that there were at least four epistemological issues in the affair, and I am very doubtful that they can all be reduced to one. Moreover, it cannot be denied that Galileo turned out to be right on at least *some* of the epistemological issues—for example, those pertaining to the legitimacy of artificial instruments and to the Bible's lacking scientific authority. On this last point it should be mentioned that it is about one hundred years since the Catholic church officially adopted the Galilean principle that the Bible is an authority only in matters of faith and morals, and not in questions of natural science. Further, it seems to me that with the epistemological issues too one must introduce the question of the rationale underlying the two conflicting positions.

That is, we must examine their respective arguments and try to determine which were the better ones, although this is a more difficult matter than is the case with the scientific arguments. Therefore, the point of this last series of considerations is not to decide the initial question with which they began, but rather to underscore the *multiplicity* of the epistemological issues in the Galileo affair and to suggest avoiding any one-sided focus on a single issue.

Finally, one must bear in mind that this episode was not merely an *intellectual* affair. Besides the scientific, epistemological, methodological, theological, and philosophical issues, and besides the arguments pro and con, there were legal, political, social, economic, personal, and psychological factors involved. To be sure it would be a mistake to concentrate on these issues, or even to devote to them equal attention in comparison with the intellectual issues, for these latter constitute the heart of the event, and so they must have priority. Nevertheless, it would be equally a mistake to neglect these external factors altogether.

To summarize, a balanced approach to the study of the Galileo affair must avoid the two opposite extremes exemplified by the anti-Galilean and the anti-Catholic interpretations. There is no easy way of doing this, but it may help to distinguish scientific from epistemological issues, factual correctness from rational correctness, essential correctness from total correctness, the several epistemological issues from each other, intellectual from external factors, and the several external factors from each other (personal, psychological, social, economic, political). However, the same caution applies here as in the case of the various interdisciplinary and cultural problems mentioned earlier: these distinct entities are also interrelated, so the point is not to deny their interaction but to make sure they are not confused with one another.

3. NONINTELLECTUAL FACTORS

Beginning with personal or psychological factors, it is easy to see that Galileo had a penchant for controversy, was a master of wit and sarcasm, and wrote with unsurpassable eloquence. Interacting with each other and with his scientific and philosophical virtues, these qualities resulted in his making many enemies and getting involved in many other bitter disputes besides the main one that concerns us here. Typically these disputes involved questions of priority of invention or discovery and fundamental disagreements about the occurrence and interpretation of various natural phenomena. It may be of some interest to give a

brief list of the other major controversies: a successful lawsuit against another inventor for plagiarism in regard to Galileo's invention of a calculating device and in regard to its accompanying instructions; a dispute with his philosophy colleagues at the University of Padua, where he taught mathematics, about the exact location of the novas that became visible in the heavens in October 1604; a dispute with other philosophers in Florence in 1612 about the reason why bodies float in water; a dispute with an astronomer named Christopher Scheiner about priority in the discovery of sunspots and about their proper interpretation; and a dispute with an astronomer named Orazio Grassi about the nature of comets, occasioned by the appearance of some of these phenomena in 1618. If we remember all this, and what it indicates about Galileo's personality, we may wonder how he managed to acquire and keep the many friends and admirers he did.

In regard to social and economic factors, it should be noted that Galileo was not wealthy. He had to earn his living, first as a university professor and then under the patronage of the grand duke of Tuscany.[13] During his university career in the first half of his life, his economic condition was always precarious. His university salary was very modest, and this was especially so given that he taught mathematics and thus received only a fraction of the remuneration given to a professor of philosophy.[14] This only compounded other unlucky family circumstances, such as having to provide dowries for his sisters. Galileo was forced to supplement his salary by giving private lessons, by taking on boarders at his house, and by working in and managing a profitable workshop which built various devices, some of his own invention. These financial difficulties eased in the second half of his life when he attained the position of "philosopher and chief mathematician" to the grand duke of Tuscany. In this position he was constantly facing a different problem, however, stemming from the nature of patronage and his relationship to his patron: since the fame and accomplishments of an artist or scientist were meant to reflect on the magnificence of his patron, Galileo was in constant need to prove himself scientifically and philosophically, either by surpassing the original accomplishments that had earned him the position or by giving new evidence for that original worth.[15]

Let us now go on to the politics of the Galileo affair. Here we have first the political background of the Catholic Counter-Reformation. Martin Luther had started the Protestant Reformation in 1517, and the Catholic church had convened the Council of Trent in 1545–1563. So

Galileo's troubles developed and climaxed during a time of violent struggle between Catholics and Protestants. Since he was a Catholic living in a Catholic country, it was also a period when the decisions of that council were being taken seriously and implemented and thus affected him directly. Aside from the question of papal authority, one main issue dividing the two camps was the interpretation of the Bible—both how specific points were to be interpreted and who was entitled to do the interpreting. The Protestants, of course, were inclined toward relatively novel and individualistic or pluralistic interpretations, whereas the Catholics were committed to relatively traditional interpretations by the appropriate authorities. In this regard, it is instructive to see exactly what the most relevant decrees of the Council of Trent stated. At its Fourth Session (8 April 1546), the council had issued two decrees about Holy Scripture, one of which contains the following paragraph:

> Furthermore, to check unbridled spirits, it decrees that no one relying on his own judgment shall, in matters of faith and morals pertaining to the edification of Christian doctrine, distorting the Holy Scriptures in accordance with his own conceptions, presume to interpret them contrary to that sense which holy mother Church, to whom it belongs to judge of their true sense and interpretation, has held and holds, or even contrary to the unanimous teaching of the Fathers, even though such interpretations should never at any time be published. Those who act contrary to this shall be made known to ordinaries and punished in accordance with the penalties prescribed by the law.[16]

And the Fifth Session (17 June 1546) issued a decree regulating the teaching of Holy Scripture, stating in part: "[so] that under the semblance of piety impiety may not be disseminated, the same holy council has decreed that no one be admitted to this office of instructor, whether such instruction be public or private, who has not been previously examined and approved by the bishop of the locality as to his life, morals and knowledge."[17]

A more specific element of religious politics concerns the fact that the final climax of the affair in 1632–1633 was taking place during the so-called Thirty Years War between Catholics and Protestants (1618–1648). At that particular juncture Pope Urban VIII, who had earlier been an admirer and supporter of Galileo, was in an especially vulnerable position; thus not only could he not continue to protect Galileo, but he had to use Galileo as a scapegoat to reassert, exhibit, and test his authority and power. The problem stemmed from the fact that in 1632

the Catholic side led by the king of Spain and by the Bohemian Holy Roman Emperor was disastrously losing the war to the Protestant side led by the king of Sweden Gustavus Adolphus. Religion was not the only issue in the war, however, which was being fought also over dynastic rights and territorial disputes. In fact, ever since his election in 1623, the pope's policy had been motivated primarily by political considerations, such as his wish to limit and balance the power of the Hapsburg dynasty which ruled Spain and the Holy Roman Empire. And it had also been motivated by personal interest—that is, by cooperation with the French, whose support had been instrumental in his election, and who for nationalistic reasons also opposed the Hapsburg hegemony. However, in the wake of Gustavus Adolphus's spectacular victories, the Spanish and imperial ambassadors were accusing Urban of having in effect favored and helped the Protestant cause. They mentioned such matters as his failure to send the kind of military and financial support that popes had usually provided on such occasions and his refusal to declare the war a holy war. There were even suspicions of a more direct understanding with the Protestants. Thus the pope's own religious credentials were being questioned, and there were rumors of convening a council to depose him.[18]

Then there was what may be called the Tuscan factor, which had at least two aspects. One was that the Grand Duchy of Tuscany whose ruler Galileo served was closely allied with Spain, and so the pope's intransigence with him was in part a way of getting back at Spain. The other was related to the fact that almost all the leading protagonists and many of the secondary figures in the Galileo affair were Tuscan. Pope Urban VIII himself was a Florentine of the House of Barberini; Tuscan also was Cardinal Robert Bellarmine, the key figure in the earlier phase of the affair; and so was the commissary general of the Inquisition during the later phase. Thus the entire episode has some of the flavor of a family squabble.

Finally, another political element involved the internal power struggle within the Church, on the part of various religious orders, such as the Jesuits and the Dominicans. Although such details are beyond the scope of this Introduction, it is interesting to note that in the earlier phase of the affair climaxing in 1616, Galileo seems to have been attacked by Dominicans and defended by Jesuits, whereas in the later phase, in 1632–1633, it seems that the two religious orders had exchanged roles.

Just as the political background of the affair involved primarily mat-

ters of religious politics, so the legal background involved essentially questions of ecclesiastical, or "canon," law. In Catholic countries, the activities of intellectuals like Galileo were subject to the jurisdiction of the Congregation of the Index and the Congregation of the Holy Office, or Inquisition. In the administration of the Catholic church a "congregation" is a committee of cardinals charged with some department of Church business. The Congregation of the Index was instituted by Pope Pius V in 1571 with the purpose of book censorship; one of its main responsibilities was the compilation of a list of forbidden books (called *Index librorum prohibitorum*); this congregation was abolished by Pope Benedict XV in 1917, and book censorship was then handled once again by the Congregation of the Holy Office, which had been in charge of the matter before 1571. The Congregation of the Holy Office, in turn, had been instituted in 1542 by Pope Paul III with the purpose of defending and upholding Catholic faith and morals; one of its specific duties was to take over the suppression of heresies and heretics which had been handled by the Medieval Inquisition; hence, from that time onward, the Holy Office and the Inquisition became practically synonymous. In 1965 at the Second Vatican Council, its name was officially changed to Congregation for the Doctrine of the Faith. The Holy Office or Inquisition was, therefore, more important and authoritative than the Index. By the time Galileo got into religious trouble, the notion of heresy had been given something of a legal definition, and inquisitorial procedures had been more or less codified. Let us examine some of the most relevant details.[19]

Although the Inquisition dealt with other offenses such as witchcraft, it was primarily interested in two main categories of crimes: formal heresy and suspicion of heresy. Here, the term *suspicion* did not have the modern legal connotation pertaining to allegation and contrasting it to proof. One difference between formal heresy and suspicion of heresy was the seriousness of the offense. For example, a standard Inquisition manual of the time stated that "heretics are those who say, teach, preach, or write things against Holy Scripture; against the articles of the Holy Faith; . . . against the decrees of the Sacred Councils and the determinations made by the Supreme Pontiffs; . . . those who reject the Holy Faith and become Moslems, Jews, or members of other sects, and who praise their practices and live in accordance with them. . . ."[20] The same manual stated that "suspects of heresy are those who occasionally utter propositions that offend the listeners . . . those who keep, write, read, or give others to read books forbidden in the Index and in

other particular Decrees; . . . those who receive the holy orders even though they have a wife, or who take another wife even though they are already married; . . . those who listen, even once, to sermons by heretics. . . ."[21] Another difference between formal heresy and suspicion of heresy was whether or not the culprit, having confessed the incriminating facts, admitted having an evil intention.[22] Furthermore, within the major category of suspicion of heresy, two main subcategories were distinguished: vehement suspicion of heresy and slight suspicion of heresy;[23] their difference depended on the seriousness of the crime. Thus, in effect there were three main types of religious crimes, in descending order of seriousness: formal heresy, vehement suspicion of heresy, and slight suspicion of heresy.

In regard to procedure, there were two ways in which legal proceedings could begin: either by the initiative of an inquisitor, responding to publicly available knowledge or publicly expressed opinion; or in response to a complaint filed by some third party, who was required to make a declaration of the purity of his motivation and to give a deposition. Then there were specific rules about the interrogation of defendants and witnesses; how injunctions and decrees were to be worded; how, when, and why interrogation by torture was to be used; and the various judicial sentences and defendant's abjurations with which to conclude the proceedings.

However important all this psychological, social, economic, political, and legal background is, the intellectual background is even more important. To this we now turn.

4. COPERNICUS'S CHALLENGE TO TRADITIONAL IDEAS

In 1543 Copernicus published his epoch-making book *On the Revolutions of the Heavenly Spheres*. In it he updated an idea which had been advanced as early as Pythagoras in ancient Greece but had been almost universally rejected—that is, the idea that the earth moves by rotating on its own axis daily and by revolving around the sun once a year. This means that the earth is not standing still at the center of the universe, with all the heavenly bodies revolving around it. In its essentials this geokinetic idea turned out to be true, as we know today beyond any reasonable doubt, after five centuries of accumulating evidence. At the time, however, the situation was very different. In fact, Copernicus's accomplishment was really to give a *new* argument in sup-