The Title Page and Preface of Galileo’s Dialogue

For a century it has been universally assumed that Galileo wrote his celebrated Dialogue in a deliberate attempt to defeat the purpose of an edict issued by the Church to prohibit Copernican books. Scholarly opinions on matters of great importance in our cultural history, to say nothing of opinions about Galileo’s character and his scientific views, have been profoundly affected by that assumption. Yet in the form just stated, the assumption is certainly defective. The Church edict did not prohibit even the De revolutionibus of Copernicus himself, from which were removed only a few passages of no importance to its scientific content. Moreover, the basis of Galileo’s summons to Rome for trial was not the edict, but an alleged earlier command applying only to Galileo personally. It would be closer to historical truth to assume that Galileo wrote his Dialogue in an attempt to aid the Church in overcoming contemporary misunderstanding of the edict — precisely as he said in his preface Al discreto letitore.

Such a complete reversal of a long-accepted belief is here set forth only after long study of the surviving documents relating to Galileo, his Dialogue, and his trial. To adduce all the evidence in favour of it and reply to all objections would be far more than can be done in the present paper. My principal purpose here is to throw light on Galileo’s preface to the Dialogue, which has never been taken seriously because of its strange and artificial appearance. Also to be explained is a conspicuous disparity between the ending of that preface and the opening speech in the text which immediately follows it. No one seems to have commented on that, or to have perceived the relation of both to the printed title page of the Dialogue, with an examination of which I think it best to begin.

Although Italian writers now customarily refer to Galileo’s book as Dialogo dei (or sui) Massimi Sistemi, no such precise phrase appeared on the long title page of 1632. The first English translator, probably Joseph Webbe of London, was content in 1634 to put the printed title page word for word into English, but his translation,
left unpublished, remained without influence on others.\textsuperscript{1} In 1635 the widely circulated Latin translation by Matthias Bernegger supplied a misleading short title,\textsuperscript{2} followed by an accurate rendering of the Italian subtitle: \textit{Systema Cosmicum authore Galileo Galilei \ldots in quo quatuor dialogis, de duobus Maximis Mundi Systematibus \ldots disseritur}. The first published vernacular translation, by Thomas Salusbury, appeared at London in 1661; though he worked from both the original and the Latin version, it was the latter which principally determined his title: \textit{The Systeme of the World: in Four Dialogues. Wherein the Two Grand Systemes of Ptolomy and Copernicus are largely discorked of \ldots By Galileus Galileus}. The next translator, Emil Strauss in 1892, avoided the previously established error of imputing to Galileo a book on \textit{the} system of the world: \textit{Dialog über die beiden haptsächlichen Weltsysteme}. In 1953, after pondering long over the original printed title, I decided to call my translation \textit{Dialogue Concerning the Two Chief World Systems — Ptolemaic and Copernican}.

Thus, neglecting Joseph Webbe at the beginning, common Italian usage and all translators have supplied Galileo’s book with some principal subject, though none appeared on the printed title page of 1632. Omitting only the author’s employment and affiliations, that read:

\textit{Dialogo di Galileo Galilei \ldots Dove ne i congressi di quattro giornate si discorre sopra i due Massimi Sistemi del Mondo, Tolemaico, e Copernicano, proponendo indeterminatamente le ragioni Filosofiche, e Naturali tanto per l’una, quanto per l’altra parte.}

Many precedents existed among books in this popular didactic form for a \textit{dialogo nel quale} \ldots, but Galileo’s \textit{Dialogo Dove} \ldots may be unique. Usually a \textit{dialogo} was \textit{sopra}, or \textit{intorno a}, or \textit{del} some clearly named topic, after which various other things touched on in it were often recited in a subtitle to attract buyers. The printed title of Galileo’s \textit{Dialogue} occasions a certain discomfort because it is so easy for us to rearrange the same words more tastefully. Since the book was the production not of a novice but of a master of Italian style, we are entitled to suspect some compelling reason behind its curiously phrased title. Or we might suspect that Galileo had had a principal subject in mind while writing his book, to which discussion of the two world systems was subsidiary or incidental, and then that at the last moment he decided not to name it. However absurd that may sound now, it is what actually happened, though Galileo’s strange last-minute decision was not,
strictly speaking, entirely his, or really strange, or literally last-minute. The circumstances are easily documented.

In 1630 Galileo carried to Rome the manuscript of a completed book on which he had laboured since 1624. Because he intended it to be published at Rome under the auspices of the Lincean Academy, it needed the Roman imprimatur. The Master of the Holy Palace required various revisions before licensing it, and while Galileo was revising the book at Florence the head of the Lincean Academy died at Rome; moreover, an outbreak of plague not only made a return to Rome inconvenient but would have required fumigation on all pages of any manuscript sent there. Galileo decided to have his dialogue printed at Florence, which entailed his getting a new license there. No mystery remains about his original title for the Dialogue in the light of a letter dated 24 May 1631 from the Roman to the Florentine licensor:

Il Sig. Galilei pensa di stampar costi una sua opera, che già haveva il titolo De fluxu et refluxu maris, nella quale discorre probabilmente del sistema Copernicano secondo la mobilità della terra, e pretende d’agevolar l’intendimento di quel’arcano grande della natura con questa posizione, corroborandoli vicendevolmente con questa utilità. Venne qua à Roma a far veder l’opera, che fu da me sottoscritta, presuppotato l’accommodamenti che dovevano farsì, e riportatici ricever l’ultima approvazione per la stampa. Non potendo ciò farsi per gl’impedimenti dele strade e per lo pericolo degli’originali, desiderando l’autore di ultimare costi il negozio, V.P.M.R. potrà valersì della sua autorità, e spedire o non spedire il libro senz’altra dependenza dalla mia revisione; ricordando però, esser mente di Nostro Signore che il titolo e soggetto non si proponga del flusso e refluxo, ma assolutamente della matematica considerazione della posizione Copernicana intorno al moto della terra, con fine di provare che, rimossa la rivelazione di Dio a la dottrina sacra, si potrebbono salvarle le apparenze in questa posizione, sciogliendo tutte le persuasioni contrarie che dall’esperienza e filosofia peripatetica si potessero addurre, si che non mai conceda la verità assoluta, ma solamente la hypothetica e senza le Scritture, a questa opinione. Deve anco mostrarsi che quest’opera si faccia solamente per mostrare che si sanno tutte le ragioni che per questa parte si possono addurre, e che non per mancamento di saperle si sia in Roma bandita questa sentenza, conforme al principio e fine del libro, che di qua manderò aggiustati. Con questa cauzione il libro non haverà impedimento alcuno qui in Roma, e V.P.M.R. potrà compiacere l’autore e servir la Serenissima Altezza, che in questo mostra si gran premura. Me le ricordo servitore, e la priego a favorirmi de’ suoi commandamenti. ³

Clearly the manuscript which Galileo took to Rome had carried the title Dialogo del flusso e refluxo del mare above the (printed) subtitle mentioning discussions of arguments for and against the two world systems, which latter has since been made to supply the absence of any specific title. If any doubt remains because the
Roman licensor chose to put the title into Latin, it may be added that from 1624 to 1629, when Galileo was composing the book and had occasion to mention it in letters to friends, he invariably called it "my dialogues on the tides." Only once that I have noted, late in 1629, did he so much as mention the Copernican system in connection with it.\(^1\) But once he knew the terms of the Roman license, in August 1630, he alluded in a letter to *i Dialogi che scrivo esaminando i 2 sistemi massimi Tolemaico e Copernicano in grazia del flusso e reflusso.\(^5\) Even while making the required revisions, then, Galileo himself continued to think of his book as on the subject of tides, discussion of the world systems being included only for the benefit of his explanation of that *arcano grande della natura.* And that is exactly how his manuscript was described in the first sentence of the letter of the licenser who had read it at Rome.

The *principio e fine* to be sent *aggiustati* from Rome are of great importance to the whole story of the *Dialogue.* By *principio* was meant Galileo’s address *Al discreto letitore,* which needed rearrangement in order to conform with the altered title. The original form and content of this preface will be reconstructed below. By *fine* was meant what in other documents concerning the *Dialogue* was called "the medicine of the end"; it consisted of the pope’s own argument designed to preclude any impression that Galileo’s tide theory was, or could be, more than a mere scientific speculation. The basic position had been stated to Galileo by Urban VIII no later than 1624, and perhaps earlier, when he was still cardinal.\(^6\) Of general applicability, and not confined to the tides, it held that motion of the earth could not be conclusively proved from any set of appearances, since it lay in God’s power to produce the same effects by any number of means, of which many remain unimaginable by us. Galileo himself used that position, not only in the *Dialogue* but earlier, as a caution against overconfidence in scientific conclusions.\(^7\)

Actual composition of the *Dialogue* was not commenced until late in 1624. In order to understand Galileo’s preface, even before it was altered to comply with the conditions for publication imposed by the Roman licenser, it is necessary to consider some events of earlier years. We should in fact start with the Church edict of 1616 which regulated books dealing with motion of the earth, as Galileo himself did in the printed address *Al discreto letitore,* of which the opening sentence is:

Si promulgò a gli anni passati in Roma un salutifero editto, che, per ovviare a’ pericoli scandoli dell’età presente, imponeva opportuno silenzio all’opinione Pittagorica della mobilità della terra.\(^8\)
The edict had come as a severe disappointment to Galileo at the time it was issued. For two years before that he had devoted most of his energies to a campaign against those who wished to see the Church make an article of faith out of a purely scientific question. In 1613 he had gone so far as to write, in a widely circulated letter to a former pupil, that Scripture should be put in the last place in deciding such questions. In 1615 that letter was called to the attention of the Roman inquisitors, who submitted it for examination to a qualified theologian. His report stated that although some infelicitous expressions were found in the letter, Galileo’s position was on the whole good Catholic doctrine. Galileo himself was confident throughout his campaign that if the matter were ever taken up by truly responsible Church authorities, they would follow the express warnings of St. Augustine and would not expose the faith to possible contempt on the part of heretics who were fully informed in scientific matters. In February 1616, at Rome, against the advice of Roberto Cardinal Bellarmino, Galileo forced the issue. The decision went against him and he was instructed by the cardinal to abandon the Copernican propositions. On 5 March the “salutary edict” was issued by the Congregation of the Index on order of Pope Paul V.

Galileo had said for two years that he would be ruled by any official action taken, and he was as good as his word. Before 1616 he had vigorously opposed any intervention by the Church. After the edict was issued, he remained silent on Copernicanism for several years and occupied himself with other things. The only evidence of his disappointment that I have noted came in 1618, when he expressed regret that he could not publish his explanation of tides because that depended on ascribing the Copernican motions to the earth.

Galileo’s treatise on the tides had in fact been written out at Rome in January 1616, for Alessandro Cardinal Orsini, and it was immediately after Orsini’s next meeting with the pope that Paul V conferred with Bellarmino and decided to initiate official action. He sent the two propositions of fixed sun and moving earth to the eleven Qualifiers of questioned doctrines, who unanimously held them to be “false and absurd in Philosophy” and therefore rash and erroneous in the faith. Galileo had supposed the question to be settled was whether the Bible had spoken to the sun’s motion literally or only metaphorically; if the latter, then Copernicanism remained open to debate. The Qualifiers, on the other hand, treated all debate on the matter as settled by Aristotelian natural philosophy. They even went so far as to classify belief in a fixed sun as heresy, that being contradicted literally by various biblical
passages. The pope, however, wisely ignored that extreme opinion, and the edict was so worded as to prohibit only two things: attempted reconciliation of the Copernican proposition with the Bible, or assertion that motions of the earth were physically real.

That the edict was not intended to stop the use of terrestrial motion as a scientific hypothesis is evident from its express mention of Copernicus’s own book, which was suspended until “corrected” by removal of a few sentences mentioning scriptural interpretation or calling the earth a “star”; that is, a planet. Only two other books were named, both by theologians, and though there were many astronomical books that contained Copernican diagrams and calculations, none were prohibited at the time.

In 1623 Maffeo Cardinal Barberini became Pope Urban VIII, and in 1624 Galileo journeyed to Rome to pay homage to this old friend and admirer of his. Cardinal Zollern, who was also in Rome, told Urban at this time that the 1616 edict was an embarrassment to the Church in Germany, where prospective intellectual converts were all Copernicans. The pope replied that Copernicanism had never been declared heretical and never would be, though neither could it be conclusively proved. Galileo knew of this conversation and reported it in a letter at the time. The intellectual climate of Rome had greatly changed with the accession or Urban VIII, to whom Galileo’s *Il Saggiatore* had been dedicated by the Lincean Academy in 1623. Several Linceans were appointed to positions in the Vatican.

When Galileo left Rome in June 1624, he had had six audiences with the pope, in the course of which it appears that he gained permission, and perhaps encouragement, to proceed with the book that was eventually published as the *Dialogue*. It is difficult to be sure how nearly Galileo and Urban were in agreement on the plan of that book. Certainly the pope had no intention of repealing the edict, though there is later evidence that he had never approved of its issuance. An event in 1630 which confirmed the situation reported by Cardinal Zollern suggests that Urban may have sympathized with any plan that would neutralize effects of the edict that were adverse to the interests of the Church, particularly among intellectuals. This event was reported to Galileo in March 1630 by Benedetto Castelli, a former pupil and close friend of Galileo’s who had been called to Rome by Urban to superintend hydraulic engineering projects there:

Il Padre [Tommaso] Campanella, parlando a’ giorni passati con Nostro Signore, li hebbe a dire che haveva hauti certi gentilhuomini Tedeschi alle mani per convertirli alla fede Catolica, e che erano assai ben disposti; ma
che havendo intesa la prohibizione del Copernico etc., che erano restati in modo scandalizati, che non haveva potuto far altro: e Nostro Signore li ripose le parole precise seguenti: "Non fu mai nostra intenzione; e se fosse toccato a noi, non si sarebbe fatto quel decreto."^14

It seems safe to infer that although Barberini did not actively oppose the edict in 1616, his view had always been similar to Galileo's; that is, that outright prohibition had not been intended by the Church, and that official intervention on its part could only work to its eventual disadvantage. In any case it is probable that in 1624 he agreed with Galileo that the edict did not prevent Catholic use of motion of the earth as a scientific hypothesis.^15 Now, Galileo's tide theory employed that hypothesis for solution of a scientific problem, and he had long wished to publish it. He could do so, if permitted, in a way that would show everyone that existence of the 1616 edict did not impede scientific progress, but only forbade overconfident assertions about physical reality or the mingling of science with scriptural interpretation. He would in fact show scientifically that no experiment practicable on earth could prove or disprove its motion, which he knew to support the pope's theological argument. If he raised and answered traditional arguments and added new ones, it would be clear to all that the edict was based not on ignorance of science, but on reasons of a totally different kind, wholly in the province of theology. Italy would be seen to retain its scientific leadership in Europe without contravening the true intent and scope of the edict.

Galileo's actions from 1624 to 1630 conformed to this plan, though the extent to which he outlined it to Urban and received his approval of it is debatable. His first move was to reply at length to the weak anti-Copernican arguments that had been submitted to him in 1616 by Francesco Ingoli, head of the Propaganda Fidei. In his long reply he stressed the need of showing that Catholics were fully informed in science, and developed the idea of relativity of motion which was incorporated in the Dialogue, begun in that form by the end of 1624. The pope was shown the reply to Ingoli, which appeared to have his approval.

Let us now return to the preface Al discreto lettore, which Galileo knew would be read by the pope and must therefore have been written in accordance with whatever plan Galileo had outlined to him. It continued as follows:

Non mancò chi temeriamente asserì, quel decreto essere stato parto non di giudizioso esame, ma di passione troppo poco informata, e si udirono
querele che consultori totalmente inesperti delle osservazioni astronomiche non dovevano con proibizione repentina tarpà l’ale a gl’intelletti speculativi.

That sentence has seemed to all modern commentators heavy-handed irony bordering on hypocrisy, since it was primarily Galileo himself who had expressed such sentiments during the years 1613-16. But the above sentence in context referred to events after passage of the edict, not before any action had been taken. The rash critics meant were German Protestants such as those reported by Cardinal Zollern in 1624 and Thomas Campanella in 1630, not Italian Catholics who had questioned the advisability of Church intervention in the first place. Galileo himself had gone to Rome in 1615-16 to make sure that Church officials were fully informed, as he went on to say:

Non potè tacer il mio zelo in udìr la temerità di si fatti lamenti. * Guidicai, come pienamente instrutto di quella prudentissima determinazione, comparir pubblicamente nel teatro del mondo, come testimonió di sincera verità. Mi trovai allora presente in Roma; ebbe non solo udienze, ma ancora applausi de i più eminenti prelati di quella Corte; nè senza qualche mia antecedente informazione segui poi la pubblicazione di quel decreto.

Here there was indeed a vein of irony, but not bitter; on the contrary it would much amuse those few who knew the story of Galileo’s “antecedent information.” Perhaps it was misleading to the public to imply that the Church had sought and received Galileo’s comments before issuing the edict, but nothing could now be gained by greater precision. And since Galileo had never questioned the supreme authority of the Church in all matters of scriptural interpretation, neither could any harm come of this very incomplete but literally quite true account. Next:

Per tanto è mio consiglio nella presente fatica mostrare alle nazioni forestiere, che di questa materia se ne sa tanto in Italia, e particolarmente in Roma, quanto possa mai averne immaginato la diligenza oltramontana; e raccogliendo insieme tutte le speculazioni proprie intorno al sistema Copernicano, far sapere che precedette la notizia di tutte alla censura Romana, e che escono da questo clima non solo i dogmi per la salute dell’anima, ma ancora gl’ingegnosi trovati per delizie degli ingegni.

Before proceeding further into the preface, I call attention to its printed opening sentence. That was extraordinarily abrupt, since the raising at once of the matter of the edict cannot possibly have been appropriate for a book on the subject of tides. No one but Galileo himself associated tides with motions of the earth at that time. Something else must originally have come first, alluding to
tides; and this, or part of it, was then transferred to become the third of *tre capi principali* to be treated in the *Dialogue*:

Nel terzo luogo proporrò una fantasia ingegnosa. Mi trovavo aver detto, molti anni sono, che l'ignoto problema del flusso del mare potrebbe ricever qualche luce, ammesso il moto terrestre. Questo mio detto, volando per le bocche degli uomini, aveva trovato padri caritativi che se l'adottavano per prole di proprio ingegno. Ora, perchè non possa mai comparire alcuno straniero che, fortificandosi con l'armi nostre, ci rinfacci la poca avvertenza in uno accidente così principale, ho giudicato palesare quella probabilità che lo renderebbero persuasibile, dato che la Terra si moveva. Spero che da queste considerazioni il mondo conoscerà, che se altre nazioni hanno navigato più, noi non abbiamo speculato meno, e che il rimettersi ad asserir la fermezza della Terra, e prender il contrario per capriccio matematico, non nasce da non aver contezza di quant'altri ci abbia pensato, ma, quando altro non fusse, da quelle ragioni che la pietà, la religione, il conoscimento della divina onnipotenza, e la conscienza della debolezza dell'ingegno umano, ci somministrano.

Placed thus third among three topics to be considered, the tides could not be called more than an *accidente principale*; but when they had been the main subject of the whole book, Galileo must have begun by stressing the importance of the tide problem. Also a trace remains above of some previous mention of navigation and speculation, as well as of Italy and foreign nations. Though it is hazardous to put words into Galileo's mouth, even in English, I suppose that his original preface to the dialogue on tides began along these lines:

The problem of the cause of ocean tides has baffled natural philosophers from antiquity to our day. Aristotle himself could not explain them, and some say that in despair of this he hurled himself into the sea and so met with his death. The ignorant attribute these great movements of huge bodies of water to the influence of the moon, while the learned have been unable to improve on that. Yet now that Columbus and Vespucci have discovered new worlds across great oceans, to the glory of Italian navigation, the unsolved problem of the tides has acquired practical as well as speculative importance to mankind, and still no physical explanation has seemed possible.

If we now read the authentic paragraph previously cited (except the sentence *Nel terzo luogo ...*), the whole leads quite easily from the original topic of the book to Galileo's account of the 1616 edict which so abruptly opens the printed preface. Suggestion of the earth's motion as a possible key to solution of the tide problem would alert the *discreto lettore* to an attendant problem of a different kind, while the concluding reference to piety and religion at once allayed his fears and ushered in consideration of the edict. Not
only Galileo’s plan for the Dialogue, but his usual style, suggests this reconstruction of an earlier preface in place of the usual account of the printed version as having been written tongue-in-check by an ironical hypocrite.

Without the sentence Nel terzo luogo ... there were only two heads of discourse, so I have changed the first word of the paragraph that in the printed preface includes the allusion to the tides:

Due capi principali si tratteranno. Prima cercherò di mostrare, tutte l’esperienze fattibili nella Terra essere mezzi insufficienti a concluder la sua mobilità, ma indifferentemente potersi adattare così alla Terra mobile, come anco quiescente; e spero che in questo caso si paleseranno molte osservazioni ignote all’antichità.

That was effectively done in the Second Day, the First Day being a general preparation for the wide range of discussions to follow. In the Second Day Galileo developed his new physics of relative motion, composition of motions, and conservation of motion. Galileo perhaps cared less that it answered traditional objections against Copernicus than that it was a creation of his own which was capable of resolving many problems of terrestrial motions. The idea that Galileo created a new physics in order to support Copernicus is mistaken, though widespread. It is now certain that Galileo’s physics was virtually completed before the telescope diverted his attention to astronomy, and his first unequivocal statement in favour of Copernicanism came three years after that.

Secondariamente, si esamineranno li fenomeni celesti, rinforzando l’ipotesi Copernicana come se assolutamente dovesse rimaner vittoriosa, aggiungendo nuove speculazioni, le quali però servano per l’utilità d’astronomia, non per necessità di natura.

These things occupy the Third Day, in which commentators often point out the conspicuous lack of planetary astronomy of the kind to which Ptolemy, Copernicus, Tycho Brahe, and Kepler devoted their lives. This has appeared to them a very puzzling omission in a book purporting to discuss the two chief world systems. Indeed it would have been, had Galileo written his book for the purpose implied by the censored title page as printed. In a book on tides, however, it was physics and not astronomy that needed to be explained to readers. There was no previous book from which a useful knowledge of the elementary principles of physics could be obtained. On the other hand there was an abundance of books at any level of understanding from which
astronomy could be learned. Ptolemaic astronomy had nothing to do with tides, and Galileo did not explain it or even describe it. Even the Copernican astronomy was described in the Dialogue only to the extent of an elementary diagram based on one in the introductory chapter of De revolutionibus. Traditional devices of planetary astronomy — eccentric circles, epicycles, and equants — were barely mentioned and not explained at all. The Third Day took up novel astronomical matters such as the location of supernovas, the motions of sunspots, and ways in which stellar parallax might be detected, but ignored the usual questions. Had the book retained the title Dialogue on the Tides . . ., no one would now be surprised at its neglect of planetary astronomy, and that was the title Galileo had in mind when he wrote the book.17

Alteration of the title and preface of the Dialogue naturally entailed a change also of the opening speeches. A passage near the end of the Third Day, overlooked by Galileo and the censors when the book was revised for printing, betrays the way in which it had originally opened. There Salviati, who served as Galileo’s spokesman, said:

E perché mi pare che assai a lungo si sia in questi tre giorni discorso circa il sistema dell’universo, sarà ormai tempo che venghiamo all’accidente massimo, dal quale presero origine i nostri ragionamenti; parlo del flusso e reflusso del mare, la cagione del quale pare che assai probabilmente si possa referire a i movimenti della Terra: ma ciò, quando vi piaccia, riserveremo al seguente giorno.18

This speech is found on p. 406 of the 1632 edition, where the first mention of the tides is on p. 205 and in no sense gave rise to the interlocutors’ discussions. The First Day, as printed, begins no less abruptly than the printed preface, and inconsistently with the end of the preface:

Fu la conclusione e l’appuntamento di ieri, che noi dovessimo in questo giorno discorrere, quanto più distintamente e particolarmente per noi si potesse, intorno alle ragioni naturali e loro efficacia, che per l’una parte e per l’altra sin qui sono state prodotte da i fautori della posizione Aristotelica e Tolemaica e da i seguaci del sistema Copernicano. E perché. . . .19

Yet on the previous page, at the end of the preface, it was no well-defined topic which the gathering was to discuss, but various wonders of God in heaven and on earth:

Erano casualmente occorsi (come interviene) vari discorsi alla spezzata tra questi Signori, i quali avevano più tosto ne i loro ingegni accesa, che consolata, la sete dell’imparare: però fecero saggia risoluzione di trovarsi alcune giornate insieme, nelle quali, bandito ogni altro negozio, si
The reader is not prepared by this for Salviati's opening statement that agreement had already been reached among the interlocutors to consider the two chief world systems, though of course the printed title page made Salviati's statement seem natural. Before the title was altered, the opening speeches must have been different, and we know from the allusion to tides as the origin of the discussions, near the end of the Third Day, that that topic was brought up originally before discussion turned to the system of the universe.

From Galileo's later *Two New Sciences*, written in dialogue form and using the same interlocutors, it is possible to judge with some confidence the probable form of the manuscript *Dialogue*. The speakers probably began, in accordance with the ending of the preface, by proposing for a first topic of discussion various wonders of God in heaven and on earth for which orderly explanations were desired. Among those one would expect some of the recently discovered celestial phenomena for which explanations were not found in the texts of Aristotle and on which natural philosophers were in disagreement. Then, because the setting of the dialogues had been placed in Venice, where the cyclic rise and fall of the sea is more conspicuous than elsewhere in Italy, the cause of that motion would afford a natural question. Sagredo could recall that their common friend the Academician (as Galileo was called in the *Dialogue*) had once proposed motion of the earth as a probable solution, to which Simplicio would object that Aristotle had proved the earth to be fixed at the center of the universe. Salviati would reply that nonetheless, the hypothesis of motion of the earth had been useful to astronomers and might be able to aid in other scientific speculations as well, though it could be neither proved nor disproved. There was also a question as to the validity of Aristotle's assumptions and demonstrations. The lively support of Simplicio for Aristotle would then lead naturally to a decision to put aside the problem of tides until arguments for and against the earth's motion had been duly examined, at which point Salviati's printed opening speech — except for the word "yesterday" — would be appropriate, and the rest could be left as in the manuscript.

The probable history of the title, preface, and opening speeches of the *Dialogue* has now been set forth. Galileo had spent five years
organizing and writing the book in accordance with the plan accommodating his personal wish to expound his tide theory with the exigencies of the Church under conditions created by the 1616 edict. He was therefore fully conscious of the need to preserve the form of his manuscript as nearly intact as possible. Most of the objections he encountered at Rome were easy to meet because Galileo had anticipated them. His basic tactical principle in doing this was that of Cardinal Bellarmino, who had meanwhile died, but who when living had continually urged that as long as motions of the earth were treated as purely hypothetical, no conflict with scriptural passages could ever arise. Since Galileo had taken pains throughout the Dialogue to comply with Bellarmino’s principle, he was ready and willing to remedy any oversights in that regard, and nearly every objection could be met in that way.

Nevertheless one difficulty arose that was nearly fatal to the book, and that was papal opposition to Galileo’s tide theory. Even though Galileo had taken care to present that as a purely hypothetical consequence of the Copernican motions, Urban was not satisfied. His special concern can be guessed from the compromise he finally accepted, which was removal of any mention of the tides from the title and subject of the Dialogue, and inclusion at its end of his own argument based on God’s power to have produced the same phenomena in an unlimited number of ways. From this it appears to me that Urban VIII, who for strategic reasons wanted the Church to license a book which freely discussed the Copernican arguments, to counter the prevailing interpretation of the 1616 edict abroad, would under no circumstances permit it to appear that endorsement of that discussion constituted endorsement by the Church of a tide theory linked to the Copernican motions of the earth.

It was probably Galileo himself who proposed removal of the tides from the printed title page, though he was fully aware that it would be impossible to replace that with any other principal subject. This was toward the end of his stay at Rome in 1630, when he was not dealing directly with the pope, or even with the Master of the Holy Palace, but with Raffaello Visconti, who had been appointed to carry out the detailed review of the book. At any rate, on 3 June 1630 Orso d’Elci wrote to Galileo:

Mi rallegrò che V.S. trovi il compagno [Visconti] del Maestro del Sacro Palazzo capace della verità della sua dottrina, et che egli speri di persuadervi anche il Papa per rimuoverlo dalla noia che dà a S.B. ne la dimostrazione che V.S. vuol fare, che il flusso proceda dal moto della terra.
The *dottrina* meant was of course not Copernicanism, but the principle of Cardinal Bellarmino that hypothetical treatment obviated any conflict with scripture. That it was the title page as such which remained the last seemingly insuperable problem is clear from the letter written by Visconti to Galileo on 16 June:

Il Padre Maestro gli bacia le mani, et dice che l’opera gli piace, et che dommattina parlerà con il Papa per il frontispizio dell’opera, et che del resto, accommodando alcune poche cosette, simili a quelle che accommodam di insieme, gli darà il libro. Et io gli resto servitore.  

Ten days later Galileo left Rome for Florence, entirely satisfied. The pope granted him a parting audience at which he showed great affection for him, while Urban’s nephew, Francesco Cardinal Barberini, gave Galileo a farewell dinner. So reported the Tuscan ambassador, who added that the entire Roman court honoured Galileo as was his due.

As mentioned above, removal of the tides as subject of the *Dialogue* did not permit substitution of another subject. It would have been absurd for the Church to license a book on the Ptolemaic and Copernican systems exclusively, since the issue between them had been officially decided in 1616. It would not have been impossible to license a book discussing the merits of a hypothesis to be applied to a specific unsolved scientific problem such as the tides, and Galileo had designed his title page in that way. All that could be done was to delete the line referring to the tides, leaving everything else untouched; and that is what accounts for the amateurish appearance of the printed title page of a book written by a master of Italian style.

How the reordering of Galileo’s preface and the truncation of the opening speeches in his *Dialogue* followed inexorably from papal interference with the title of a very astutely organized book has been amply explained. The book was destined to become a symbol of the struggle for freedom of inquiry and of a supposed inherent conflict between religion and science. As a result, the seemingly trifling problem of giving it an acceptable title has had consequences of great magnitude, because Galileo’s *Dialogue* has been read by cultural historians as intended to accomplish purposes quite different from those envisioned by its author. To comment on even the most serious of the misunderstandings that now prevail would take me far beyond my present purpose, which is only to call attention to a neglected story of no little importance to larger issues. It is necessary, however, to explain briefly in closing how it came about that a book whose publication was
approved by a friendly pope became the source, a few months later, of Urban's boundless rage and vindictive persecution of its author.23

The defective assumption set forth at the beginning of this paper associates the trial and condemnation of Galileo with his supposed deliberate violation of the 1616 edict by publishing the *Dialogue*. There was no such violation; in fact, it is a bit ridiculous to suppose that Galileo would set out to evade an old edict by reminding readers of it in the first sentence of his preface. No less absurd is the idea that the Roman licensor of books could fail, in view of that sentence, to examine the book most scrupulously for any possible evasion or violation of the edict. The principle of Bellarmino was known to, and accepted by, the theologians who were asked to re-examine the *Dialogue* after Galileo was first summoned to Rome, just as it had been known to and accepted by the licensers. Their report was concerned mainly with passages in which purely hypothetical treatment of the earth's motion might be overlooked; these, they said, could easily be amended if the book was judged to have sufficient merit in other ways to continue in circulation.24

Galileo was brought to trial at Rome in 1633 on the charge of "vehement suspicion of heresy" because he was believed to have violated not the 1616 edict, but a personal command given to him before the edict was issued. The pope was shown a memorandum to the effect that Galileo had been ordered never to teach the Copernican propositions in any way, orally or in writing, lest the Holy Office proceed against him. Disobedience of such a command was *prima facie* evidence for the charge, and any information about the Copernican system disseminated by Galileo in the *Dialogue* was evidence of guilt under it. This had nothing to do with the edict as such, or with any other Catholic than Galileo, and the pre-trial documents as well as the hearings of the first day of his trial show that if the memorandum which so angered the pope had not existed, there would probably have been no trial of Galileo.

Urban's indignation against Galileo is understandable; he felt that his old friend had deliberately concealed from him information that alone would have sufficed in 1624 to have prevented his approval of Galileo's project, no matter how much it appealed to him otherwise. Now, the memorandum was unsigned by anyone named in it, though it purported to set forth events which had taken place in the presence of a notary and witnesses. To have any legal value, such a document would have had to be signed by all persons involved, one of whom was Cardinal Bellarmino. At his trial, Galileo produced an affidavit, in Bellarmino's own hand, that he had been told only of the decision applying to all Catholics as
set forth in the edict, and had agreed to be ruled by it. In order to
save its reputation and maintain its authority, the Roman Inquisi-
tion then obtained from Galileo a confession to some lesser
offences, which became the legal basis of his conviction and
sentencing. In that way the edict, as well as the legally worthless
memorandum, came to be incorporated into Galileo’s sentence and
abjuration, to the everlasting shame of his judges and at the cost of
misapplication of the edict for the next two centuries, until it was
finally repealed.25

Perhaps nothing will remove from our folklore, or even from
scholarly tradition, all the misapprehensions that currently exist
about Galileo and his Dialogue. They arose, in my opinion, largely
because the trial documents were not published in full until the
1870’s, in a context of warfare between theologians and scientists
over Darwinian evolution theory. Traditionalists and freethinkers
formed anti-Galileo and anti-Church factions that did not provide
the best milieu for objective research. Such factions are easily
mistaken for pro-Galileo and pro-Church camps, but those would
be very different adversary positions indeed. In my opinion they
are just beginning to form, and are not adversary positions at all.
From their future dialogue, I believe, will emerge not a picture of
heroes and villains, but one of tragic human misunderstandings
among those who, in Plato’s words as paraphrased by Kepler, seek
truth on one path and many paths.

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NOTES

1 The bound manuscript, beautifully written, is preserved at the British Library,
Harleian ms. 6320. Thomas Hobbes, who left England in mid-1634 to tour
Europe, told Galileo of its existence when visiting him late in 1635.

2 The short title “system of the world” probably came to be applied to the Dialogue
because of Galileo’s promise in his Sidereus Nuncius of 1610 to publish such a
book, described also in a letter of that year as 2 libri De sistemate seu constitutione
universi, concetto immenso e pieno di filosofia, astronomia, et geometria (to Belisario
Vinta, 7 May 1610; Opere, X, 351). In the same letter he mentioned a work De maris
estu separately, and it was that, not De sistemate, which eventually became the
Dialogue. He again mentioned his promised systematic work in a book published
in 1612, but after the edict of 1616 when he received inquiries from abroad
about it, he replied that it had been “stayed by a higher hand.” Foreign
translators of the Dialogue understandably assumed it to be the long-promised
treatise, and doubtless some parts of that survive in the Dialogue, which is,
however, rather a treatise on preponderance of evidence than a book full of
philosophy, astronomy, and geometry.

3 Opere di Galileo Galilei, Edizione Nazionale, XIX, 327. Above, and hereinafter,
referred to simply as Opere.

4 To Elia Diodati, 29 October 1629: “. . .ho ripreso i miei Dialogi intorno al flusso
e reflusso . . . e subito li publicherò; dove, oltre a quello che s’aspetta alla
materia del flusso, saranno inseriti molti altri problemi et una amplissima confermazione del sistema Copernicano . . .” (Opere,XIV,49). Galileo alluded to a newly discovered argument based on annual variations in the paths of sunspots which had induced him to take up again and complete the book which he had laid aside for some time.

To G. B. Baliani, 6 August 1630, only a month after Galileo’s return from Rome (Opere,XIV,130).

The event was described by Augustino Oregio in his De Deo uno (Rome, 1629). Scholars have disagreed on the date, his phrase *adhuc Cardinales* being of somewhat ambiguous reference in the original text. I am inclined to believe that, the event involving Galileo belonged to 1624 and that Oregio meant only that Barberini when still a cardinal was noted for his doctrine, since in thereafter telling the specific story he began: *Sanctissimus dixit . . .* No personal meeting between Galileo and Barberini between 1611 and 1624 is recorded.

Thus in 1613, before any of the public controversies involving theology, Galileo had published in his Sunspot Letters reasons for regarding as merely probable all the *controversie condizioni delle sustanze naturali; le quali poi finalmente sollevandoci all’ultimo scopo di nostre fatiche, cioè all’amore del divino Artefice, ci consenrono la speranza di poter apprender in Lui, fonte di luce e di verità, ogni altro vero* (Opere,V,188). In the First Day, considering whether light and dark parts of the moon might indicate the presence of land and water, he wrote: “But because there are more ways known to us that could produce the same effect, and perhaps others that we do not know of, I shall not make bold to affirm one rather than another to exist on the moon,” and, in reply to a speculation whether plants and animals might exist on the moon: “. . . regarding the production there of things similar to or different from ours, I should always reply, ‘Very different and unimaginable by us’; for this seems to me to fit with the richness of nature and the omnipotence of the Creator and Ruler.” The arrogance of scientific opinion ascribed to Galileo by writers like Arthur Koestler is not detectable in his books or letters; what was at issue in Galileo’s day was not his firmness of conviction, but his challenge of the firm convictions of professors of philosophy.

Continuations of the preface cited below will not be further referenced, as being also on this or the following page.

This move was originally sponsored by professors of philosophy at the University of Pisa, as Galileo clearly stated in his letters. At least a year elapsed before they succeeded in bringing a priest into the attack. When the Roman inquisitors had questioned the priest and others whom he named, they dropped the inquiry.

The only book prohibited by it was by a theologian; Galileo’s Sunspot Letters, in which he had expressed confidence that the Copernican system would triumph, was not mentioned.

Galileo’s tide theory had been linked with his preference for the Copernican system from the outset, in 1595, and appears to have been the basis of his first real interest in the new astronomy.

The phrase cited above had been standard for centuries in judging philosophical opinions to be erroneous in the Catholic faith. It appears not to have been previously applied to a question of fact capable of decision by scientific inquiry.

To Federico Cesi, 8 June 1624 (Opere,XIII,182).

16 March 1630; Opere,XIV,87-88.

This is what I shall call “Bellarmino’s principle”; see below.

Galileo used the word *zeo* frequently to describe his Catholicism in the letters of 1613-16, and elsewhere later in life, but so far as I know he never employed the word in any other connection. It is evident that many cardinals, some other highly placed ecclesiastics, and the rulers of Tuscany never doubted Galileo’s Catholic zeal or ever suspected him of the Copernican zeal now commonly ascribed to him. I can find no evidence of the latter, and much counter-evidence, such as his refusal to speak out in favour of Copernicanism when urged by Kepler to do so in 1597, his advice to Castelli not to teach the new
astronomy at Pisa coupled with the statement that he himself had never done so in eighteen years as professor at Pisa and Padua, and the paucity of references to Copernicanism in letters, even to close friends, except during 1613-16 when its official suppression was being rumoured.

17 It is only the baseless claim that Galileo was a Copernican zealot, mentioned in the preceding note, coupled with inattention to the circumstances under which the Dialogue was begun and to Galileo's original title for it, that has given rise to the notion that he concerned himself with planetary astronomy. Galileo's lifelong interest was in questions of motion, which included the cosmological question of deciding which heavenly bodies were at rest and which were moving. His only detailed investigations of celestial motions related to Jupiter's satellites, concerning which his working papers include voluminous observations and calculations. Hardly a page survives which reflects work on planetary motions.

18 Opere, VII, 439.

19 Opere, VII, 33.

20 Cf. n. 15, above. From 1613 to 1616 Galileo vigorously opposed the treatment of the earth's motion as merely hypothetical, or the ascription of such an intention to Copernicus. After passage of the edict in 1616 he accepted Bellarmino's principle as the best choice open to Catholics. Its only deleterious effect on Catholic scientists would be in time to make them look foolish by reason of an obligation to go on treating as hypothetical some propositions that would come to be regarded by other scientists as established as firmly as anything in physical science ever is.

21 Opere, XIV, 113.

22 Opere, XIV, 120.


24 Opere, XIX, 326-27. Items 3 and 4 of the report are amusingly counterpoised: 3. Mancarsi nell'opera molte volte e recedere dall' ipotesi. . . . 4. Tratta la cosa come non decisa. Later on some other examiners were extremely hostile to the book and its author, but that was after it had become a focus of internal Church politics, and does not concern us here.

25 Actual repeal, or rather the dropping of Copernican books from the Index, awaited deliberate defiance of it by a Catholic astronomer in 1818, but in fact the Dialogue had been printed in 1744 with Church permission, together with an approved explanatory preface, and after 1757 the absurd precedent established by Galileo's condemnation was tacitly ignored under liberalizing rules decreed by Pope Benedict XIV for the Index of Prohibited Books.