



woman who shared his private hours for twelve years and bore him three children.

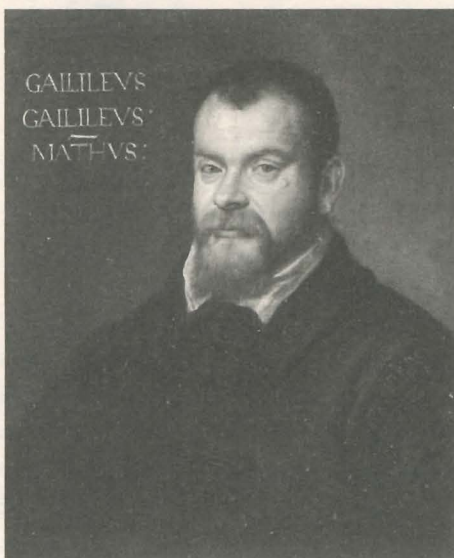
Marina did not share his house, however. Galileo dwelled on Padua's Borgo dei Vignali (renamed, in recent times, Via Galileo Galilei). Like most professors, he rented out rooms to private students, many of them young noblemen from abroad, who paid to board under his roof for the duration of their private lessons with him. Marina lived in Venice, where Galileo traveled by ferry on the weekends to enjoy himself. When she became pregnant, he moved her to Padua, to a small house on the Ponte Corvo, only a five-minute walk away from his own (if one could have counted minutes in those days). Even after the ties between Marina and Galileo were strengthened by the growth of their family, their separate living arrangement remained the same.

Suor Maria Celeste Galilei, née "Virginia, daughter of Marina from Venice," was "born of fornication," that is to say, out of wedlock, according to the parish registry of San Lorenzo in the city of Padua, on the thirteenth of August 1600, and baptized on the twenty-first. Marina was twenty-two on this occasion, and Galileo (though no mention divulges his identity), thirty-six. Such age discrepancies occurred commonly among couples at that time. Galileo's own father had reached forty-two years before taking the twenty-four-year-old Giulia as his bride.

The following year, 1601, again in August, a registry entry on the twenty-seventh marked the baptism of "Livia



Engraving of Galileo at age thirty-eight, by Joseph Calendi



Portrait of Galileo at age forty-two,
by Domenico Robusti

trary, I will always desire such a position."

But he did not obtain the position just then. He continued his teaching at Padua and his research, which focused on establishing the mathematical principles of simple machines such as the lever, and determining how bodies accelerate during free fall—one of the most important unresolved questions of seventeenth-century science. "To be ignorant of motion is to be ignorant of Nature," Aristotle had said, and Galileo sought to end the general ignorance of Nature's laws of motion. Later that year, however, in the summer of 1609, Galileo was distracted from his motion experiments by rumors of a new Dutch curiosity called a spyglass, or eyeglass, that could make faraway objects appear closer than they were. Though few Italians had seen one firsthand, spectacle makers in Paris were already selling them in quantity.

Galileo immediately grasped the military advantage of the new spyglass, although the instrument itself, fashioned from stock spectacle lenses, was little more than a toy in its first incarnation. Seeking to improve the spyglass by augmenting its power, Galileo

Cosimo's accession gave Galileo the perfect opportunity to petition for the coveted court post, as he had created it in his dreams. "Regarding the everyday duties," Galileo wrote in his application to Florence, "I shun only that type of prostitution consisting of having to expose my labor to the arbitrary prices set by every customer. Instead, I will never look down on serving a prince or a great lord or those who may depend on him, but, to the con-

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Maria Celeste's letter of August 31, 1623

economy. They grew a few fruits and vegetables to feed themselves, did all their own cleaning and cooking, and also produced articles for outside sale, such as fine embroidered handkerchiefs, lace, herbal medicines, and bread in the summertime, when it was too hot for anyone else to bake. The rough brown habits they wore, with black linen veil and knotted cord belt, never showed the dirt of their menial labors.

Suor Maria Celeste, muscially talented like most members of her family, also directed the choir from time to time and taught the novices how to sing Gregorian chant. In her capacity as the convent's apothecary, she assisted the visiting doctor, fabricated

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Engraving of Galileo at age sixty, by Ottavio Leoni

made Italy lose face among scientists abroad. There were rumors, too—to make Urban wince—of Germans on the verge of converting to Catholicism who backed away because of the edict.

Urban, now more than halfway through the first year of his pontificate, was proud to say he had never supported that decree, and that it would not have seen the light had he been pope in those days. As a cardinal, he had successfully intervened, along with his colleague Bonifazio Cardinal Caetani, to keep “heresy” out of the edict’s final wording. Thus, although the consultants to the Holy Office had called the immobility of the Sun “formally heretical” in their February 1616 report, the March 5 edict merely



Galileo's house at Bellosguardo, where he lived from 1617 to 1631

had recently been transferred to Rome, where he now tried vainly to keep Galileo's nephew in line. But this Vincenzo stayed out all night with rascallions, ran up debts, and flouted religious decorum so flagrantly that his Roman landlord threatened to have him denounced to the Holy Office of the Inquisition.

In Brescia, meanwhile, resident clerics ignored Galileo's transfer of the pension from one Vincenzo Galilei to another: They elected a citizen of their own town to serve as canon. (Galileo waited a few years for the popular Brescian to die and create a new vacancy before he tried to install another family member in that post.)

With his house filled to the rafters, Galileo abandoned Bellosguardo when he next fell ill in mid-March of 1628, taking refuge at the home of acquaintances in Florence.

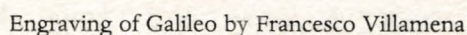
"Something in the peaceful air today," Suor Maria Celeste wrote him when he had recovered and returned to his own quarters,

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The Assayer, too, had negotiated official channels smoothly. But Galileo suspected the substance of the *Dialogue* might give the censors serious cause for concern.



NOW THAT THE TEMPEST of our many torments has subsided somewhat, I want to make you fully aware of the events, Sire, without leaving anything out, for in so doing I hope to ease my



Galileo's house, Il Gioiello, in Arcetri,
where he lived from 1631 to 1642

with military tents popping up like anthills and Il Gioiello clearly identifiable among the neighborhood houses.

Il Gioiello stood in ruins for several years after the siege. Then it was refurbished and rebuilt, with thick stone walls that met at the corners of rooms in graceful arches called lunettes, with floors of brick laid out in herringbone patterns, with intricate wooden ceilings and wide windows that were shuttered, barred, and set so low they seemed to kneel into the street. Four very large rooms and three smaller ones shared the ground floor, with a kitchen and wine cellar below, and rooms for two servants above.

What Galileo loved best about the place was the sunny garden to the south of the house, reliably watered by the *tramontana*, and the semi-enclosed loggia facing the courtyard near the well, where potted fruit trees might pass the colder months in safety.

"We lament the time away from you, Sire, covetous of the pleasure we would have drawn from this day, had we found ourselves all together in each other's company. But, if it please God, I expect that this will soon come to pass, and in the meanwhile I enjoy the hope of having you here always near us."

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Frontispiece of Galileo's *Dialogue*; the three figures represent, from left to right, Aristotle, Ptolemy, and Copernicus

where a fellow mathematician commented, "Wherever I begin, I can't put it down."

The copies destined for Rome, however, were held up until May on the advice of Ambassador Niccolini, who apologized that current Roman quarantine regulations required all shipments of imported books to be dismantled and fumigated—and no one wanted to see the *Dialogue* subjected to such treatment. Galileo got around this obstacle by sending several presentation copies into Rome via the luggage of a traveling friend, who distributed

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*Torricelli (1608-47)



The trial of Galileo

sick, having been away all of May and June, we agreed that I was to return here the autumn immediately following. While I was in Florence, the plague broke out and commerce was stopped; so, seeing that I could not come to Rome, by correspondence I requested of the same Master of the Sacred Palace permission for the book to be printed in Florence. He communicated to me that he would want to review my original manuscript, and that therefore I should send it to him. Despite having used every possible care and having contacted even the highest secretaries of the Grand Duke and the directors of the postal service, to try to send the said original safely, I received no assurance that this could be done, and it certainly would have been damaged, washed out, or burned, such was the strictness at the borders. I related to the same Father Master this difficulty concerning the shipping of the book, and he ordered me to have the book again very scrupulously reviewed by a person acceptable to him; the person he

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by the grace of God; for I made him see that he was clearly wrong and that in his book he had gone too far."

The commissary, a Dominican priest like Father Riccardi but trained as a military engineer, well understood the virtues of the Copernican worldview. More than that, he personally preferred to separate the construction of

the universe from considerations of Holy Writ. But in that private tête-à-tête, he persuaded Galileo to confess so as to let the affair end quietly with the least loss of face all around.

"The Tribunal will retain its reputation and be able to use benignity with the accused," the commissary concluded his report to Cardinal Barberini. "However things turn out, Galileo will recognize the grace accorded to him, and all the other satisfactory consequences that are wished for will follow."

On Saturday, the last day of April, Galileo reentered the commissary's chambers for a second formal hearing.

Over these intervening days of reflection, Galileo explained as he began the next set of his remarks recorded in the trial transcript, it had occurred to him to reread his *Dialogue*, which he had not looked at for the past three years. He meant to see whether, contrary to his own beliefs, something had perchance fallen from his pen to give offense.

"And, owing to my not having seen it for so long," he explained, "it presented itself to me like a new writing and by another author. I freely confess that in several places it seemed to me set forth in such a form that a reader ignorant of my real purpose might have had reason to suppose that the arguments brought on the false side, and which it was my intention to con-



Image envisioning Galileo in prison

422

io eccaduto in qualche parte come ha già detto presso questa
 scrittura con una fede aggiunta del giorno 22^{mo} di Giugno 1633.
 mine scritte di propria mano del medesimo Card. della quale già
 presentai una copia di mia mano. Del rimanente mi rimetto in
 tutto, e per tutto alla solita pietà, e clemenza di questo Tribuna-
 le et habito: et subscriptione fuit remissa ad domum sup^{ra}.
 Vixit Magni Crucis modo, et formam h^{is} notis.
 Io Galileo Galilei manu p^{ro}p^{ria}.

Final lines of Galileo's handwritten confession to the Inquisition

abjuration, and have recited it word by word in Rome, at the
 Convent of the Minerva, this 22nd day of June 1633.

I, Galileo Galilei, have abjured as above, with my own
 hand.

It is often said that as Galileo rose from his knees he muttered
 under his breath "Eppur si muove" (But still it moves). Or he
 shouted out these words, looking toward the sky and stamping his
 foot. Either way, for Galileo to voice such undaunted conviction



having such an order from you at the moment, I render the requisite thanks for the favor received, which I so fervently desired; and with the most respectful love I bow to you and kiss your robe, wishing you every happiness this most holy Christmas.

In truth Galileo was not so much home now as under perpetual house arrest. Later he would dateline his letters, "From my prison in Arcetri." He was forbidden to receive any visitors who might discuss scientific ideas with him. Nor could he go anywhere except to the neighboring convent, where the private reunion with his daughters revealed the true emotional cost to Suor Maria Celeste of the long, anxious separation. She had been frequently ill, he discovered, but had paid too little attention to herself.

Galileo might have expected her to regain her stamina now in the relief of his repatriation and the sudden respite from responsibility for his affairs. But instead she grew weaker.



Unsigned, undated portrait thought to be of Suor Maria Celeste

"Most of all I am distressed by the news of Suor Maria Celeste," Nicolò Aggiunti wrote from Pisa when Galileo told him of her condition. "I know the fatherly and daughterly affection which exists between you; I know the lofty intellect, and the wisdom, prudence, and goodness with which your daughter is endowed, and I know of no one who in the same way as she remained your unique and gentle comforter in your tribulations."

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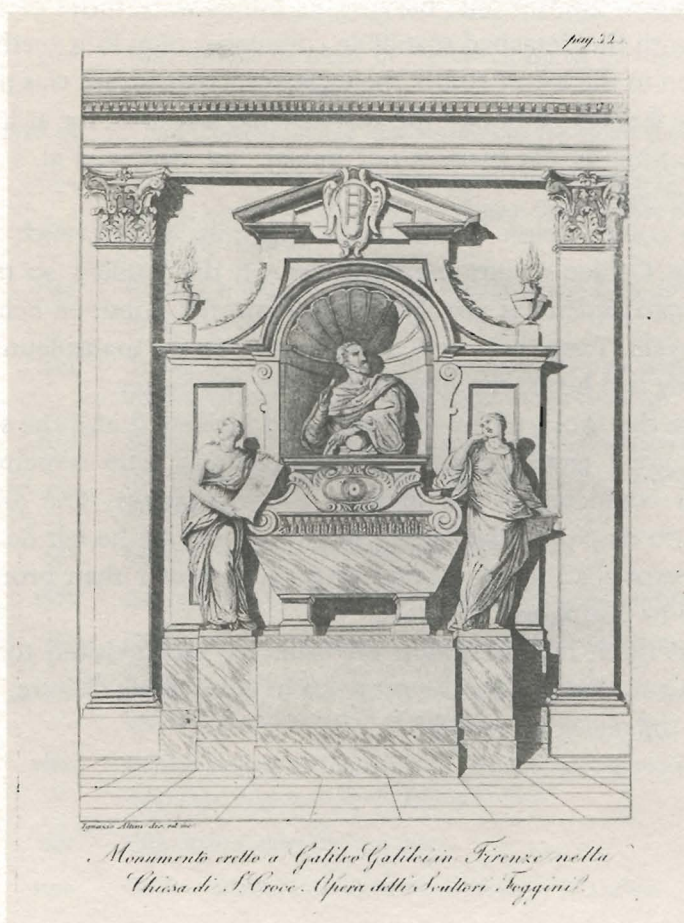
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stone walls that had been frescoed by Giotto to trace the life of Saint Francis.

The assembly placed the body at the new site, then returned to the little chapel and set about repeating the procedure—smashing the older brick container under the 1674 memorial Viviani had mounted for Galileo, and pulling out another wooden coffin. This one had apparently been damaged over time, its lid bashed in and littered with broken pieces of plaster. As the men dragged the



Galileo's tomb in Santa Croce



Galileo offering his telescope to the Muses

art, but Viviani also promulgated the belief that Michelangelo's spirit had leaped like an inspiration from his aged, failing body to the infant Galileo in the brief span of hours separating the former's death from the latter's birth.

The original design for Galileo's monument called for three female forms to attend him—the muses of Astronomy, Geometry, and Philosophy, who would stand symmetrically opposed to Mi-



Engraving of Galileo by Francesco Zucchi

brother Prince Mattia, who was conveniently just leaving for Germany on a military mission, to hand-deliver sections of the contraband manuscript to Galileo's contact there. Alas, Father Christopher Scheiner, the Jesuit astronomer formerly known as "Apelles," had returned to Germany by this point, strengthening the anti-Galileo feelings in that country and making the licensing of the new book there highly unlikely.

At the end of various intrigues, Diodati found Galileo a Dutch publisher, Louis Elzevir, who visited him at Il Gioiello in May of 1636 to settle their agreement. (Although Galileo was now technically forbidden to receive visitors, Elzevir numbered among several distinguished foreign callers, including philosopher Thomas Hobbes, who came after reading an unauthorized English translation of the *Dialogue*, and poet John Milton.*) Fra Micanzio in Ven-

to see this happen in France, in the city of Lyons, the home of Galileo's distant relative Roberto Galilei, a businessman who facilitated all French correspondence with the Italian scientist. However, Galileo soon had another offer of publication help in 1635 from an Italian engineer working for the Holy Roman Emperor and eager to have *Two New Sciences* printed in Germany. Grand Duke Ferdinando voluntarily lent his aid to this plan, commissioning his

*In 1644, in his prose polemic *Areopagitica* defending freedom of the press, Milton wrote: "I have sat among their learned men and been counted happy to be born in such a place

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"I see that you hand," Fra Micanz certain pages, "an would be absolute

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In June of 16 *Two New Scienc* ended with Sagr ful allusion to cussion meetin might enjoy "ture." Printing Leiden, Hollan and the publish came out the spring.

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ice, who knew both parties to the publishing contract, volunteered to serve as conduit between Arcetri and Holland; this gave the old theologian the pleasure of reading *Two New Sciences* in installments as each finished part reached him.

"I see that you took the trouble to transcribe these in your own hand," Fra Micanzio once remarked with surprise upon receipt of certain pages, "and I don't see how you can stand it, for to me it would be absolutely impossible."

While Galileo refined the main themes, he also expanded the content of the book to include some seemingly unrelated sections. After all, who knew when he would ever secure another opportunity to publish anything?

"I shall send as soon as possible this treatise on projectiles," Galileo promised in December 1636 while finalizing Day Four of *Two New Sciences*, "along with an appendix [twenty-five pages long] on some demonstrations of certain conclusions about the centers of gravity of solids, found by me at the age of 22 after two years of study of geometry, for it is good that these not be lost."

In June of 1637, Galileo sent off the last pieces of dialogue for *Two New Sciences*, which ended with Sagredo's hopeful allusion to other discussion meetings the trio might enjoy "in the future." Printing began at Leiden, Holland, that fall, and the published volume came out the following spring.

Safe in a Protestant country, the Dutch pub-

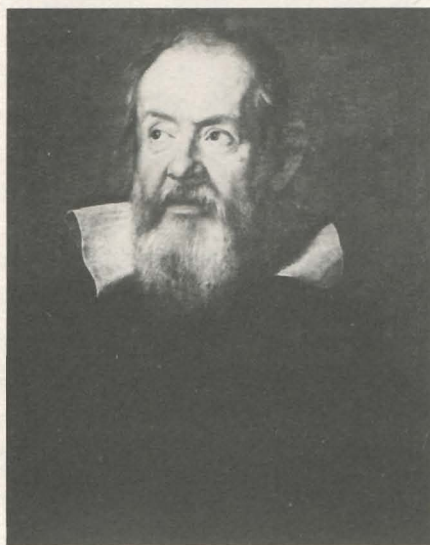


John Milton visiting Galileo at Il Gioiello

of philosophic freedom as they supposed England was, while they themselves did nothing but bemoan the servile condition into which learning amongst them was brought; that this was it which had damped the glory of Italian wits, that nothing had been there written now these many years but flattery and fustian. There it was that I found and visited the famous Galileo, grown old, a prisoner of the Inquisition."

jectures of Copernicus and his followers offered to the contrary are all removed by that most sound argument, taken from the omnipotence of God. He being able to do in many, or rather in infinite ways, that which to our view and observation seems to be done in one particular way, we must not pretend to hamper God's hand and tenaciously maintain that in which we may be mistaken. And just as I deem inadequate the Copernican observations and conjectures, so I judge equally, and more, fallacious and erroneous those of Ptolemy, Aristotle, and their followers, when without going beyond the bounds of human reasoning their inconclusiveness can be very easily discovered.

Upon Castelli's return to Rome, he resumed his efforts to see Galileo's sentence of house arrest commuted, though these proved unsuccessful. Castelli continued to say mass for Galileo every morning (until his own death in 1643), and the two close friends



Painting of Galileo at age seventy-one,
by Justus Sustermans

kept in touch on matters of mutual interest. Concluding a letter to Castelli on the hydraulics of fountains and rivers, Galileo expressed gratitude for the solace of his companionship over a lifetime: "Bereft of my powers by my great age and even more by my unfortunate blindness and the failure of my memory and other senses, I spend my fruitless days which are so long because of my continuous inactivity and yet so brief compared with all

the months and other comfort friendships, of served than all with you."

Still Galileo's longitude problems of ratios of number of other recorded nor rep

"I have in my notions," he wrote new and partly received, of which others written by other serious permit me to lent, and so putting myself in pilgrim mind

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