

# Life of Galileo

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10 January 1610. Using the telescope, Galileo discovers celestial phenomena that confirm the Copernican system. Warned by his friend of the possible consequences of his research, Galileo proclaims his belief in human reason

January ten, sixteen ten:  
Galileo Galilei abolishes heaven.

*Galileo's study in Padua. Night. Galileo and Sagredo at the telescope, wrapped in heavy overcoats.*

*SAGREDO looking through the telescope, half to himself:* The crescent's edge is quite irregular, jagged and rough. In the dark area, close to the luminous edge, there are bright spots.

They come up one after the other. The light starts from the spots and flows outwards over bigger and bigger surfaces, where it merges into the larger luminous part.

GALILEO: What's your explanation of these bright spots?

SAGREDO: It's not possible.

GALILEO: It is. They're mountains.

SAGREDO: On a star?

GALILEO: Huge mountains. Whose peaks are gilded by the rising sun while the surrounding slopes are still covered by night. What you're seeing is the light spreading down into the valleys from the topmost peaks.

SAGREDO: But this goes against two thousand years of astronomy.

GALILEO: It does. What you are seeing has been seen by no mortal except myself. You are the second.

SAGREDO: But the moon can't be an earth complete with mountains and valleys, any more than the earth can be a star.

GALILEO: The moon can be an earth complete with mountains and valleys, and the earth can be a star. An ordinary celestial body, one of thousands. Take another look. Does the dark part of the moon look completely dark to you?

SAGREDO: No. Now that I look at it, I can see a feeble ashy-grey light all over it.

GALILEO: What sort of light might that be?

SAGREDO: ?

GALILEO: It comes from the earth.

SAGREDO: You're talking through your hat. How can the earth give off light, with all its mountains and forests and waters; it's a cold body.

GALILEO: The same way the moon gives off light. Both of them are lit by the sun, and so they give off light. What the moon is to us, we are to the moon. It sees us sometimes as a crescent, sometimes as a half-moon, sometimes full and sometimes not at all.

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SAGREDO: In other words, there's no difference between the moon and earth.

GALILEO: Apparently not.

SAGREDO: Ten years ago in Rome they burnt a man at the stake for that. His name was Giordano Bruno, and that is what he said.

GALILEO: Exactly. And that's what we can see. Keep your eye glued to the telescope, Sagredo, my friend. What you're seeing is the fact that there is no difference between heaven and earth. Today is 10 January 1610. Today mankind can write in its diary: Got rid of Heaven.

SAGREDO: That's frightful.

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SAGREDO *is reluctant to go to the telescope*: I feel something not all that remote from fear, Galileo.

GALILEO: I'm about to show you one of the shining milky-white clouds in the Milky Way. Tell me what it's made up of.

SAGREDO: They're stars, an infinite number.

GALILEO: In Orion alone there are 500 fixed stars. Those are the countless other worlds, the remote stars the man they burned talked about. He never saw them, he just expected them to be there.

SAGREDO: But even supposing our earth is a star, that's still a long way from Copernicus's view that it goes round the sun. There's not a star in the sky that has another star going round it. But the moon does go round the earth.

GALILEO: Sagredo, I wonder. I've been wondering since

the day before yesterday. Here we have Jupiter. *He focuses on it*. Round it we have four smaller neighbouring stars that are invisible except through the tube. I saw them on Monday but without bothering to note their position. Yesterday I looked again. I could swear the position of all four had changed. I noted them down. They've changed again. What's this? I saw four. *Agitated*: Have a look.

SAGREDO: I can see three.

GALILEO: Where's the fourth? There are the tables. We must work out what movements they might have performed. *Excited, they sit down to work*. *The stage darkens, but Jupiter and its accompanying stars can be seen on the cyclorama. As it grows light once more they are still sitting there in their winter coats*.

GALILEO: That's the proof. The fourth one can only have gone behind Jupiter, where it can't be seen. So here you've a star with another one going round it.

SAGREDO: What about the crystal sphere Jupiter is attached to?

GALILEO: Yes, where has it got to? How can Jupiter be attached if other stars circle round it? It's not some kind of prop in the sky, some base in the universe. It's another sun.

SAGREDO: Calm down. You're thinking too quickly.

GALILEO: What d'you mean, quickly? Wake up, man! You're seeing something nobody has ever seen before. They were right.

SAGREDO: Who, Copernicus and his lot?

GALILEO: And the other fellow. The whole world was against them, and they were right. Andrea must see this! *In great excitement he hurries to the door and shouts*: Mrs Sartil! Mrs Sartil!

SAGREDO: Don't get worked up, Galileo!

GALILEO: Get worked up, Sagredo! Mrs Sartil!

SAGREDO *turns the telescope away*: Stop bellowing like an idiot.

GALILEO: Stop standing there like a stuffed dummy when the truth has been found.

SAGREDO: I'm not standing like a stuffed dummy; I'm trembling with fear that it may be the truth.

GALILEO: Uh?

SAGREDO: Have you completely lost your head? Don't you realise what you'll be getting into if what you see there is true? And if you go round telling all and sundry that the earth is a planet and not the centre of the universe?

GALILEO: Right, and that the entire universe full of stars isn't turning around our tiny little earth, anyone could guess.

SAGREDO: In other words that it's just a lot of stars. Then where's God?

GALILEO: What d'you mean?

SAGREDO: God! Where is God?

GALILEO *angrily*: Not there anyway. Any more than he'd be here on earth, suppose there were creatures out there wanting to come and look for him.

SAGREDO: So where is God?

GALILEO: I'm not a theologian. I'm a mathematician.

SAGREDO: First and foremost you're a human being. And

I'm asking: where is God in your cosmography?

GALILEO: Within ourselves or nowhere.

SAGREDO *shouting*: Like the man they burned said?

GALILEO: Like the man they burned said.

SAGREDO: That's what they burned him for. Less than ten years back.

GALILEO: Because he couldn't prove it. Because it was just a hypothesis. Mrs Sarti!

SAGREDO: Galileo, ever since I've known you you've known how to cover yourself. For seventeen years here in Padua and three more in Pisa you have been patiently teaching the Ptolemaic system proclaimed by the Church and confirmed by the writings the Church is based on. Like Copernicus you thought it was wrong but you taught it just the same.

GALILEO: Because I couldn't prove anything.

SAGREDO *irredulously*: And do you imagine that makes any difference!

GALILEO: A tremendous difference. Look, Sagredo, I believe in Humanity, which means to say I believe in human reason. If it weren't for that belief each morning I wouldn't have the power to get out of bed.

SAGREDO: Then let me tell you something. I don't. Forty years spent among human beings has again and again brought it home to me that they are not open to reason. Show them a comet with a red tail, scare them out of their wits, and they'll rush out of their houses and break their legs. But try making one rational statement to them, and back it up with seven proofs, and they'll just laugh at you.

GALILEO: That's quite untrue, and it's a slander. I don't see how you can love science if that's what you believe. Nobody who isn't dead can fail to be convinced by proof.

SAGREDO: How can you imagine their pathetic shrewdness has anything to do with reason?

GALILEO: I'm not talking about their shrewdness. I know they call a donkey a horse when they want to sell it and a horse a donkey when they want to buy. That's the kind of shrewdness you mean. But the horny-handed old woman who gives her mule an extra bundle of hay on the eve of a journey, the sea captain who allows for storms and dolphins when laying in stores, the child who puts on his cap once they have convinced him that it may rain: these are the people I pin my hopes to, because they all accept proof. Yes, I believe in reason's gentle tyranny over people. Sooner or later they have to give in to it. Nobody can go on indefinitely watching me – *he drops a pebble on the ground* – drop a pebble, then say it doesn't fall. No human being is capable of that. The lure of a proof is too great. Nearly everyone succumbs to it; sooner or later we all do. Thinking is one of the chief pleasures of the human race.

*Cosmo quickly stoops down and politely hands Andrea the model.*

*Meantime Galileo unobtrusively shifts the other model to one side.*

GALILEO *at the telescope*: As your highness no doubt realises, we astronomers have been running into great difficulties in our calculations for some while. We have been using a very ancient system which is apparently consistent with our philosophy but not, alas, with the facts. Under this ancient, Ptolemaic system the motions of the stars are presumed to be extremely complex. The planet Venus, for instance, is supposed to have an orbit like this. *On a board he draws the epicyclical orbit of Venus according to the Ptolemaic hypothesis.* But even if we accept the awkwardness of such motions we are still unable to predict the position of the stars accurately. We do not find them where in principle they ought to be. What is more, some stars perform motions which the Ptolemaic system just cannot explain. Such motions, it seems to me, are performed by certain small stars which I have recently discovered around the planet Jupiter. Would you gentlemen care to start by observing these satellites of Jupiter, the Medicean stars?

ANDREA *indicating the stool by the telescope*: Kindly sit here.

PHILOSOPHER: Thank you, my boy. I fear things are not quite so simple. Mr Galileo, before turning to your famous tube, I wonder if we might have the pleasure of a disputation? Its subject to be: Can such planets exist?

MATHEMATICIAN: A formal dispute.

GALILEO: I was thinking you could just look through the telescope and convince yourselves?

ANDREA: This way, please.

MATHEMATICIAN: Of course, of course. I take it you are familiar with the opinion of the ancients that there can be no stars which turn round centres other than the earth, nor any which lack support in the sky?

GALILEO: I am.

PHILOSOPHER: Moreover, quite apart from the very possi-

bility of such stars, which our mathematician — *he turns towards the mathematician* — would appear to doubt, I would like in all humility to pose the philosophical question: are such stars necessary? Aristotle's *divini universum* . . .

GALILEO: Shouldn't we go on using the vernacular? My colleague Mr Federzoni doesn't understand Latin.

PHILOSOPHER: Does it matter if he understands us or not? GALILEO: Yes.

PHILOSOPHER: I am so sorry. I thought he was your lens-grinder.

ANDREA: Mr Federzoni is a lens-grinder and a scholar.

PHILOSOPHER: Thank you, my boy. Well, if Mr Federzoni insists . . .

GALILEO: I insist.

PHILOSOPHER: The argument will be less brilliant, but it's your house. The universe of the divine Aristotle, with the mystical music of its spheres and its crystal vaults, the orbits of its heavenly bodies, the slanting angle of the sun's course, the secrets of the moon tables, the starry richness catalogued in the southern hemisphere and the transparent structure of the celestial globe add up to an edifice of such exquisite proportions that we should think twice before disrupting its harmony.

GALILEO: How about your highness now taking a look at his impossible and unnecessary stars through this telescope?

MATHEMATICIAN: One might be tempted to answer that, if your tube shows something which cannot be there, it cannot be an entirely reliable tube, wouldn't you say?

GALILEO: What d'you mean by that?

MATHEMATICIAN: It would be rather more appropriate, Mr Galileo, if you were to name your reasons for assuming that there could be free-floating stars moving about in the highest sphere of the unalterable heavens.

PHILOSOPHER: Your reasons, Mr Galileo, your reasons.

GALILEO: My reasons! When a single glance at the stars

themselves and my own notes makes the phenomenon evident? Sir, your disputation is becoming absurd.

MATHEMATICIAN: If one could be sure of not over-exciting you one might say that what is in your tube and what is in the skies is not necessarily the same thing.

PHILOSOPHER: That couldn't be more courteously put.

FEDERZONI: They think we painted the Medicean stars on the lens.

GALILEO: Are you saying I'm a fraud?

PHILOSOPHER: How could we? In his highness's presence too.

MATHEMATICIAN: Your instrument – I don't know whether to call it your brainchild or your adopted brainchild – is most ingeniously made, no doubt of that.

PHILOSOPHER: And we are utterly convinced, Mr Galilei, that neither you nor anyone else would bestow the illustrious name of our ruling family on stars whose existence was not above all doubt. *All bow deeply to the grand duke.*

COSIMO *turns to the ladies of the court*: Is something the matter with my stars?

THE OLDER COURT LADY: There is nothing the matter with your highness's stars. It's just that the gentlemen are wondering if they are really and truly there.

*Pause.*

THE YOUNGER COURT LADY: I'm told you can actually see the wheels on the Plough.

FEDERZONI: Yes, and all kinds of things on the Bull.

GALILEO: Well, are you gentlemen going to look through it or not?

PHILOSOPHER: Of course, of course.

MATHEMATICIAN: Of course.

*Pause. Suddenly Andrea turns and walks stiffly out across the whole length of the room. His mother stops him.*

MRS SARTTI: What's the matter with you?

ANDREA: They're stupid. He tears himself away and runs off.

PHILOSOPHER: A lamentable boy.

CHAMBERLAIN: Your highness: gentlemen: may I remind you that the state ball is due to start in three quarters of an hour.

MATHEMATICIAN: Let's not beat about the bush. Sooner or later Mr Galilei will have to reconcile himself to the facts. Those Jupiter satellites of his would penetrate the crystal spheres. It is as simple as that.

FEDERZONI: You'll be surprised: the crystal spheres don't exist.

PHILOSOPHER: Any textbook will tell you that they do, my good man.

FEDERZONI: Right, then let's have new textbooks.

PHILOSOPHER: Your highness, my distinguished colleague and I are supported by none less than the divine Aristotle himself.

GALILEO *almost obsequiously*: Gentlemen, to believe in the authority of Aristotle is one thing, tangible facts are another. You are saying that according to Aristotle there are crystal spheres up there, so certain motions just cannot take place because the stars would penetrate them. But suppose those motions could be established? Mightn't that suggest to you that those crystal spheres don't exist? Gentlemen, in all humility I ask you to go by the evidence of your eyes.

MATHEMATICIAN: My dear Galileo, I may strike you as very old-fashioned, but I'm in the habit of reading Aristotle now and again, and there, I can assure you, I trust the evidence of my eyes.

GALILEO: I am used to seeing the gentlemen of the various faculties shutting their eyes to every fact and pretending that nothing has happened. I produce my observations and everyone laughs: I offer my telescope so they can see for themselves, and everyone quotes Aristotle.

FEDERZONI: The fellow had no telescope.

MATHEMATICIAN: That's just it.

PHILOSOPHER *grandly*: If Aristotle is going to be dragged in the mud – that's to say an authority recognized not only by every classical scientist but also by the chief fathers of the church – then any prolonging of this discussion is in my view a waste of time. I have no use for discussions which are not objective. Basta.

GALILEO: Truth is born of the times, not of authority. Our ignorance is limitless: let us lop one cubic millimeter off it. Why try to be clever now that we at last have a chance of being just a little less stupid? I have had the unimaginable luck to get my hands on a new instrument that lets us observe one tiny corner of the universe a little, but not all that much, more exactly. Make use of it.

PHILOSOPHER: Your highness, ladies and gentlemen, I just wonder where all this is leading?

GALILEO: I should say our duty as scientists is not to ask where truth is leading.

PHILOSOPHER *agitatedly*: Mr Galilei, truth might lead us anywhere!

GALILEO: Your highness. At night nowadays telescopes are being pointed at the sky all over Italy. Jupiter's moons may not bring down the price of milk. But they have never been seen before, and yet all the same they exist. From this the man in the street concludes that a lot else might exist if only he opened his eyes. It is your duty to confirm this. What has made Italy prick up its ears is not the movements of a few distant stars but the news that hitherto unquestioned dogmas have begun to totter – and we all know that there are too many of those. Gentlemen, don't let us fight for questionable truths.

FEDERZONI: You people are teachers: you should be stimulating the questions.

PHILOSOPHER: I would rather your man didn't tell us how to conduct a scholarly disputation.

GALILEO: Your highness! My work in the Great Arsenal in Venice brought me into daily contact with draughtsmen, builders and instrument mechanics. Such people showed me a lot of new approaches. They don't read much, but rely on the evidence of their five senses, without all that much fear as to where such evidence is going to lead them...

PHILOSOPHER: Oh!

GALILEO: Very much like our mariners who a hundred years ago abandoned our coasts without knowing what other coasts they would encounter, if any. It looks as if the only way today to find that supreme curiosity which was the real glory of classical Greece is to go down to the docks.

PHILOSOPHER: After what we've heard so far I've no doubt that Mr Galilei will find admirers at the docks.

CHAMBERLAIN: Your highness, I am dismayed to note that this exceptionally instructive conversation has become a trifle prolonged. His highness must have some repose before the court ball.

*At a sign, the grand duke bows to Galileo. The court quickly gets ready to leave.*

MRS SARTI *blocks the grand duke's way and offers him a plate of biscuits*: A biscuit, your highness? *The Older court lady leads the grand duke out.*

GALILEO *hurrying after them*: But all you gentlemen need do is look through the telescope!

CHAMBERLAIN: His highness will not fail to submit your ideas to our greatest living astronomer: Father Christopher Clavius, chief astronomer at the papal college in Rome.

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## A conversation

Galileo, feeling grim,

A young monk came to visit him.

The monk was born of common folk.

It was of science that they spoke.

*In the Florentine Ambassador's palace in Rome Galileo is listening to the little monk who whispered the papal astronomer's remark to him after the meeting of the Collegium Romanum.*

GALILEO: Go on, go on. The habit you're wearing gives you the right to say whatever you want.

THE LITTLE MONK: I studied mathematics, Mr Galilei.

GALILEO: That might come in handy if it led you to admit that two and two sometimes makes four.

THE LITTLE MONK: Mr Galilei, I have been unable to sleep for three days. I couldn't see how to reconcile the decree I had read with the moons of Jupiter which I had observed.

Today I decided to say an early mass and come to you.

GALILEO: In order to tell me Jupiter has no moons?

THE LITTLE MONK: No. I have managed to see the wisdom of the decree. It has drawn my attention to the potential dangers for humanity in wholly unrestricted research, and I have decided to give astronomy up. But I also wanted to explain to you the motives which can make even an astronomer renounce pursuing that doctrine any further.

GALILEO: I can assure you that such motives are familiar to me.

THE LITTLE MONK: I understand your bitterness. You have in mind certain exceptional powers of enforcement at the Church's disposal.

GALILEO: Just call them instruments of torture.

THE LITTLE MONK: But I am referring to other motives. Let me speak about myself. My parents were peasants in the Campagna, and I grew up there. They are simple people. They know all about olive trees, but not much else. As I study the phases of Venus I can visualise my parents sitting round the fire with my sister, eating their curdled cheese. I see the beams above them, blackened by hundreds of years of smoke, and I see every detail of their old worn hands and the little spoons they are holding. They are badly off, but even their misfortunes imply a certain order. There are so many cycles, ranging from washing the floor, through the seasons of the olive crop to the paying of taxes. There is a regularity about the disasters that befall them. My father's back does not get bent all at once, but more and more each spring he spends in the olive groves; just as the successive childbirths that have made my mother increasingly sexless have followed well-defined intervals. They draw the strength they need to carry their baskets sweating up the stony tracks, to bear children and even to eat, from the feeling of stability and necessity that comes of looking at the soil, at the annual greening of the trees and at the little church, and of listening to the bible passages read there every Sunday. They have been assured that God's eye is always on them – probing, even anxiously –: that the whole drama of the world is constructed around them so that they, the performers, may prove themselves in their greater or lesser roles. What would my people say if I told them that they happen to be on a small knob of stone twisting endlessly through the void round a second-rate star, just one among myriads? What would be the value or necessity then of so much patience, such understanding of their own poverty? What would be the use of Holy Scripture, which has explained and justified it all – the sweat, the patience, the hunger, the submissiveness – and now

turns out to be full of errors? No: I can see their eyes wavering, I can see them letting their spoons drop, I can see how betrayed and deceived they will feel. So nobody's eye is on us, they'll say. Have we got to look after ourselves, old, uneducated and worn-out as we are? The only part anybody has devised for us is this wretched, earthly one, to be played out on a tiny star wholly dependent on others, with nothing revolving round it. Our poverty has no meaning: hunger is no trial of strength, it's merely not having eaten: effort is no virtue, it's just bending and carrying. Can you see now why I read into the Holy Congregations decree a noble motherly compassion; a vast goodness of soul?

GALILEO: Goodness of soul! Aren't you really saying that there's nothing for them, the wine has all been drunk, their lips are parched, so they had better kiss the cassock? Why is there nothing for them? Why does order in this country mean the orderliness of a bare cupboard, and necessity nothing but the need to work oneself to death? When there are teeming vineyards and cornfields on every side? Your Campagna peasants are paying for the wars which the representative of gentle Jesus is waging in Germany and Spain. Why does he make the earth the centre of the universe? So that the See of St Peter can be the centre of the earth! That's what it is all about. You're right, it's not about the planets, it's about the peasants of the Campagna. And don't talk to me about the beauty given to phenomena by the patina of age! You know how the *Margaritifera* oyster produces its pearl? By a mortally dangerous disease which involves taking some unassimilable foreign body, like a grain of sand, and wrapping it in a slimy ball. The process all but kills it. To hell with the pearl, give me the healthy oyster. Virtues are not an offshoot of poverty, my dear fellow. If your people were happy and prosperous they could develop the virtues of happiness and prosperity. At

present the virtues of exhaustion derive from exhausted fields, and I reject them. Sir, my new pumps will perform more miracles in that direction than all your ridiculous superhuman slaving. — 'Be fruitful and multiply', since your fields are not fruitful and you are being declamated by wars. Am I supposed to tell your people lies?

THE LITTLE MONK *much agitated*: We have the highest of all motives for keeping our mouths shut — the peace of mind of the less fortunate.

GALILEO: Would you like me to show you a Cellini clock that Cardinal Bellarmine's coachman brought round this morning? My dear fellow, authority is rewarding me for not disturbing the peace of mind of people like your parents, by offering me the wine they press in the sweat of their countenance which we all know to have been made in God's image. If I were to agree to keep my mouth shut my motives would be thoroughly low ones: an easy life, freedom from persecution, and so on.

THE LITTLE MONK: Mr Galileo, I am a priest.

GALILEO: You're also a physicist. And you can see that Venus has phases. Here, look out there! *He points at the window*. Can you see the little Priapus on the fountain next the laurel bush? The god of gardens, birds and thieves, rich in two thousand years of bucolic indecency. Even he was less of a liar. All right, let's drop it. I too am a son of the Church. But do you know the eighth Satire of Horace? I've been rereading it again lately, it acts as a kind of counterweight. *He picks up a small book*. He makes his Priapus speak — a little statue which was then in the Esquiline gardens. Starting:

Stump of a figtree, useless kind of wood  
Was I once; then the carpenter, not sure  
Whether to make a Priapus or a stool  
Opted for the god . . .