

On the Infinite Universe and Worlds

De l'infinito, universo et mondi

Giordano Bruno

translated by Claude Opus 4.8

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Bruno's most daring cosmological work: five Italian dialogues of 1584 in which he breaks open the closed Aristotelian cosmos and proclaims a single infinite universe, animated throughout and strewn with innumerable suns and worlds. Filoteo, who speaks for Bruno, leads Elpino, the physician Fracastorio, the Aristotelian Burchio, and at last the Peripatetic Albertino out of the prison of the finite heavens into the boundless deep. A fresh English translation by Claude Opus 4.8, made from the Italian and placed in the public domain; the close of the fifth dialogue, wanting in the source, is supplied in the same hand.

The Proemial Epistle

Written to the most illustrious Signor Michel de Castelnau, Seigneur de Mauvissière, de Concessault and de Joinville, Knight of the Order of the Most Christian King, Counsellor of his Privy Council, Captain of fifty men-at-arms, and Ambassador to the most Serene Queen of England.

If I, most illustrious Knight, were to guide the plough, pasture a flock, tend a garden, or mend a garment, none would watch me, few would observe me, by scarcely any should I be reprov'd, and I might easily please all. But because I am a surveyor of the field of Nature, solicitous for the pasture of the soul, enamoured of the cultivation of the mind, and a very Daedalus as to the dispositions of the intellect — behold, he who eyes me threatens me, he who observes me assails me, he who overtakes me bites me, he who comprehends me would devour me. It is not one, nor are they few; they are many, they are almost all.

If you would understand whence this comes, I tell you that the cause is the generality that displeases me, the vulgar crowd that I hate, the multitude that does not content me, and the One that enamours me: she for whose sake I am free in subjection, content in pain, rich in want, and alive in death; she for whose sake I do not envy those who are slaves in their liberty, who bear pain in their pleasures, who are poor amid their riches, and dead in their life— for in the body they carry the chain that binds them, in the spirit the hell that weighs them down, in the soul the error that sickens them, in the mind the lethargy that kills them; there being no magnanimity to deliver them, no long-suffering

to raise them, no splendour to make them bright, no knowledge to quicken them.

Hence it comes that I do not, like one weary, draw back my foot from the arduous road; nor, like one slothful, let my arms fall from the work that offers itself; nor, like one in despair, turn my back upon the foe that withstands me; nor, like one dazzled, turn my eyes from the divine object— even while, for the most part, I am reputed a sophist, more studious to appear subtle than to be truthful; ambitious, more studious to stir up a new and false sect than to confirm the old and the true; a fowler after the splendour of fame, who sets before men the shadows of error; a restless spirit, who undermines the edifices of good discipline and makes himself a founder of engines of perversity.

So, my Lord, may the holy powers scatter from me all those who unjustly hate me; so may my God be ever propitious to me; so may all the governors of our world be favourable to me; so may the stars make the seed to the field, and the field to the seed, that there may appear to the world a useful and glorious fruit of my labour, in awakening the spirit and opening the understanding of those who are deprived of light— even as I most certainly do not feign; and if I err, I do not truly believe that I err; and, in speaking and in writing, I do not dispute for the love of victory for its own sake (for I deem every reputation and victory, where the truth is wanting, an enemy to God, most vile, and void of all honour), but for the love of true wisdom and the zeal of true contemplation do I toil, and vex, and torment myself. This shall the demonstrative arguments make manifest— arguments that hang upon living reasons, that derive from a well-ordered sense, informed by no false images; images that, like truthful ambassadors, detach themselves from the subjects of Nature, presenting themselves to those who seek them, open to those who gaze upon them, clear to those who apprehend them, and certain to those who comprehend them. And now, behold: I offer you my contemplation concerning the Infinite, the Universe, and innumerable Worlds.

The Arguments of the Dialogues

Bruno here sets out, still addressing the Ambassador, a summary of each of the five dialogues before they begin.

Argument of the First Dialogue

You have, then, in the first dialogue: first, that the inconstancy of the senses shows that sense is not the principle of certainty, and yields it only by a certain comparison and conference of one sensible thing with another, and of one sense with another; and it is inferred how truth resides in diverse subjects.

Second, the infinitude of the universe begins to be demonstrated; and the first argument is taken from this, that the world cannot be brought to an end by those who, with the work of fancy, would build it walls. Third, from the unfittingness of saying that the world is finite and that it is in itself — since this befits only the immense — the second argument is taken.

Next, the third argument is taken from the unfitting and impossible imagining of the world as being in no place; for in any case it would follow that it has no being, seeing that everything, whether corporeal or incorporeal, is — corporeally or incorporeally — in place. The fourth argument is taken from a demonstration, or most pressing question, which the Epicureans raise:

Nimirum si iam finitum constituatur
omne quod est spacium, si quis procurrat ad oras
ultimus extremas iaciatque volatile telum,
invalidis utrum contortum viribus ire
quo fuerit missum mavis longeque volare,
an prohibere aliquid censes obstareque posse?
Nam sive est aliquid quod prohibeat officiatque,
quominus quo missum est veniat finique locet se,
sive foras fertur, non est ea fini profecto.²

Fifth, that Aristotle's definition of place does not befit the first, greatest, and most common place; and that it does not avail to take the surface nearest and immediate to the contained body, and other trivialities that make place a mathematical and not a physical thing. (I leave aside that between the surface

of the container and the contained body that moves within it there is always necessarily an intervening space, to which it rather belongs to be place; and if of space we will take only the surface, we shall have to go seeking a finite place to infinity.) Sixth, that the void cannot be escaped by positing the world finite — if “void” be that in which there is nothing.

Seventh, that, just as this space in which this world is, were the world not found in it, would be understood as void, so where this world is not, void is understood. On this side of the world, then, this space is indifferent from that; therefore the aptitude this has, that has; therefore it has the act, since no aptitude is eternal without act — nay, it is act, because in the eternal, being and being-able-to-be are not different.

Eighth, that no sense denies the infinite; for we cannot deny it on the ground that we do not comprehend it by sense, but, since sense itself is comprehended by the infinite and reason comes to confirm it, we ought to posit it. Indeed, if we consider further, sense itself posits the infinite; for we ever see one thing comprehended by another, and never perceive, by outer or inner sense, a thing not comprehended by another like it:

Ante oculos etenim rem res finire videtur:
aer dissaepit collis atque aera montes,
terra mare et contra mare terras terminat omnis;
omne quidem vero nihil est quod finiat extra.
Usque adeo passim patet ingens copia rebus,
finibus exemptis in cunctas undique partis.³

By that, then, which we see, we ought rather to argue the infinite; for nothing meets us that is not bounded by another, and we experience nothing bounded by itself.

Ninth, that infinite space cannot be denied save with the voice, as the obstinate do — once it is considered that the rest of space, where there is no world and which is called void or feigned to be nothing, cannot be understood without an aptitude to contain, no less than this which contains. Tenth, that, as it is good that this world be, it is no less good that each of the infinite others be.

Eleventh, that the goodness of this world is not communicable to another world that might be, even as my being is not communicable to that of this man or that.

Twelfth, that there is neither reason nor sense why, as one posits an infinite individual, most simple and enfolding, one should not allow that there be an infinite corporeal and unfolded.

Thirteenth, that this space of the world, which to us seems so great, is neither part nor whole with respect to the infinite, and cannot be the subject of infinite operation; and that, with respect to it, what our weakness can comprehend is a non-being. And answer is made to a certain objection: that we posit the infinite not for the dignity of space, but for the dignity of the natures; because, by the same reason whereby this world is, every other that can be must be — whose power is not actualized by the being of this, even as the power of Elpino's being is not actualized by the act of Fracastorio's being.

Fourteenth, that if the infinite active power actualizes corporeal and dimensional being, this must necessarily be infinite; otherwise derogation is done to the nature and dignity both of that which can make and of that which can be made.

Fifteenth, that this universe, as commonly conceived, cannot be said to comprise the perfection of all things otherwise than as I comprise the perfection of all my members, and each globe all that is in it — that is to say, everyone is rich who lacks nothing of what he has. Sixteenth, that in any case the infinite efficient would be deficient without the effect; and we cannot conceive that such an effect should be only itself. To which is added that, for this reason, if it were or is, nothing is taken from what must be in that which is truly an effect — where the theologians name an action *ad extra* and transient, besides the immanent; for it befits that the one be infinite as well as the other. Seventeenth, that, in calling the world unbounded, quiet follows in the intellect after our manner; and from the contrary, ever and innumerably, difficulties and inconveniences. Besides, what was said in the second and third is repeated.

Eighteenth, that if the world is spherical, it is figured, it is bounded; and that bound which is beyond this bounded and figured thing (though you please to

call it nothing) is itself figured, so that its concave is joined to the convex of this world; for, where that nothing of yours begins, there is a concavity at least indifferent from the convex surface of this world.

Nineteenth, an addition is made to what was said in the second. Twentieth, what was said in the tenth is repeated.

In the second part of this dialogue, that which was demonstrated by the passive power of the universe is shown by the active power of the efficient, with several reasons. The first is taken from this, that the divine efficacy ought not to be idle — the more so when one posits an effect outside its own substance (if indeed anything can be outside it) — and that it is no less idle and envious to produce a finite effect than to produce nothing. The second, from practice: that by the contrary the reason of the divine goodness and greatness is taken away, and from this follows no inconvenience against any law or substance of theology. The third is convertible with the twelfth of the first part; and the difference between the wholly infinite and the totally infinite is set forth. The fourth: that no less for not willing than for not being able is the Omnipotence blamed, for having made the world finite and for being an infinite agent about a finite subject. The fifth induces that, if it does not make the world infinite, it cannot make it so; and if it has not the power to make it infinite, it cannot have the vigour to conserve it in infinity; and that if, by one reason, it is finite, it comes to be finite by all reasons. The sixth is convertible with the tenth of the first part; and the cause is set forth for which the theologians defend the contrary not without expedient reason, and the friendship between these learned men and the learned philosophers. The seventh, from proposing the reason that distinguishes active power from the diverse actions; and the infinite power is shown, intensively and extensively, more loftily than the community of theologians has ever done. The eighth shows that the motion of infinite worlds is not from an extrinsic mover but from their own soul, and how there is nonetheless an infinite mover. The ninth shows how infinite motion is intensively verified in each of the worlds.

Argument of the Second Dialogue

The second dialogue pursues the same conclusion. Wherein, first, it brings four reasons: of which the first is taken from this, that all the attributes of the divinity are infinite, like each one. The second, that our imagination ought not to extend further than the divine action. The third, from the indifference of the divine intellect and action, and that it understands the infinite no less than the finite. The fourth, that if a corporeal quality — a quality, I say, sensible to us — has infinite active power, what then will be the case of the whole that is in all the absolute active and passive power?

Second, it shows that a corporeal thing cannot be bounded by an incorporeal thing, but either by void or by plenum; and in any case, outside the world is space, which in the end is nothing other than matter and passive power itself, where the not-envious and not-idle active power must come into act. And the vanity of Aristotle's argument from the impossibility of dimensions is shown.

Third, it teaches the difference between the world and the universe; for whoever calls the universe one infinite necessarily distinguishes between these two names.

Fourth, the contrary reasons are brought, by which the universe is reckoned finite: where Elpino reports all the opinions of Aristotle, and Filoteo examines them. These are taken, some from the nature of simple bodies, others from the nature of composite bodies; and the vanity is shown of six arguments drawn from the definition of the motions that cannot be infinite, and of other like propositions which are without point or ground. These will more naturally make seen the reason of the differences and bound of motion, and a more real knowledge of heavy and light impulse; for by them we show how the infinite body is neither heavy nor light, and how the finite body receives such differences, and how not. And thence is laid open the vanity of Aristotle's arguments, who, arguing against those who posit the world infinite, supposes a middle and a circumference, and would have the earth occupy the centre, whether in the finite or the infinite. In conclusion, there is no proposition, great or small, that this philosopher has brought to destroy the infinity of the world — whether from the first book *On the Heaven and the World*, or from the third of the *Physics* — about which one need discourse little more than

enough.

Argument of the Third Dialogue

In the third dialogue, first, that base fancy of the figure, of the spheres, and of the diversity of heavens is denied; and it is affirmed that there is one heaven, which is a general space embracing the infinite worlds — though we deny not that there are more, indeed infinite, heavens, taking the word in another signification; for, as this earth has its heaven, which is the region in which it moves and through which it courses, so has each of all the other innumerable earths. It is made manifest whence arose the imagination of so many movers and deferents, so figured as to have two outer surfaces and one hollow inner one; and of other recipes and medicines that give nausea and horror to the very men who prescribe them, and to those wretches who swallow them down.

Second, it is noted that the general motion, and that of the said eccentrics, and as many as can be referred to the firmament, are all fantastical; for they really depend on a motion that the earth makes with its centre along the ecliptic, and four other differences of motion that it makes about the centre of its own mass. Whence it remains that the proper motion of each star is taken from the difference verifiable in it as a movable by itself through the spacious field. Which makes us understand that all the reasons of the supposed infinite movable and motion are vain, and founded on ignorance of the motion of this our globe.

Third, it is proposed that there is no star that does not move like this one — and others which, being near to us, make their local differences of motion sensibly known; but the suns, which are bodies wherein fire predominates, move otherwise than the earths, in which water predominates. And hence is manifest whence proceeds the light the stars diffuse, of which some shine by themselves and others by another.

Fourth, in what manner bodies most distant from the sun can partake of heat equally with those nearer; and the opinion attributed to Epicurus is reproved — that one sun should suffice for the infinite universe; and the true difference is set forth between those stars that twinkle and those that do not.

Fifth, the opinion of Cusanus is examined concerning the matter and habitability of worlds, and the reason of light. Sixth, how — though some bodies be of themselves luminous and hot — the sun gives not light to the sun, nor earth to the same earth, nor water to the same water; but light ever proceeds from the opposite star; as we sensibly see the whole sea shining from eminent places, as from mountains; while, being ourselves upon the sea or in the same plain, we see shining only to a small dimension the light of the sun and moon set over against us. Seventh, it is discoursed of the vanity of the quintessences; and it is declared that all sensible bodies neither are other, nor consist of other first principles, than these — which are not otherwise movable, whether by the straight or the circular. Where all is treated with reasons more accommodated to common sense, while Fracastorio accommodates himself to Burchio's wit; and it is openly manifested that there is no accident found here that is not presupposed there, even as there is nothing seen yonder from here which, considered well, is not seen from here yonder; and consequently, that fair order and ladder of nature is a pretty dream and an old wives' tale. Eighth, that, although the distinction of the elements be true, in no way is such an order of elements — as is commonly posited — sensible or intelligible; and, by Aristotle's own account, the four elements are equally parts or members of this globe, unless we will say that water exceeds; whence worthily are the stars called now water, now fire, by true natural philosophers as by divine prophets and poets, who in this neither fable nor speak in metaphor. So the worlds are understood to be these heterogeneous bodies, these animals, these great globes, wherein the earth is no heavier than the other elements, and the particles all move and change place not otherwise than the blood and humours and least parts that flow and reflow in us and in other little animals. To this purpose a comparison is brought, by which the earth, by the impulse to the centre of its mass, is found no heavier than another simple body concurring in that composition; and that the earth by itself is neither heavy, nor ascends, nor descends; and that it is the water that makes union, density, thickness, and gravity.

Ninth, the famous order of the elements being seen to be vain, the reason is inferred of these composite sensible bodies which, like so many animals and worlds, are in the spacious field that is the air or heaven or void — where are all

those worlds that contain animals and inhabitants no less than this one can, seeing they have no less virtue nor another nature. Tenth, after it is seen how the obstinate and ignorant of perverse disposition are wont to dispute, it is further shown how, for the most part, they conclude their disputations — though some are so circumspect that, with a sneer, a little laugh, a certain modest malignity, what they cannot prove by reasons they would cast back upon the antagonist's shoulders; for they come not to dispute to seek the truth, but for victory, and to seem stout defenders of the contrary. And such are to be fled by whoever has not a good cuirass of patience.

Argument of the Fourth Dialogue

In the following dialogue, first, is repeated what has elsewhere been said — how the worlds are infinite, how each moves, and how it is formed. Second, in the manner whereby, in the second dialogue, the reasons against the infinite mass of the universe were dissolved, so now — after that, in the third, the infinite multitude of worlds is determined — the many reasons of Aristotle against it are dissolved; though this word “world” has one meaning with Aristotle, another with Democritus, Epicurus, and others. That argument from natural and violent motion would have it that one earth should move toward another; and by resolving these persuasions first, foundations of no small importance are laid for seeing the true principles of natural philosophy. Second, it is declared that, though the surface of one earth were contiguous to another, the parts of the one could not move to the other — understanding the heterogeneous parts, not the atoms and simple bodies; whence a lesson is taken to consider better the nature of the heavy and light. Third, for what cause these great bodies have been disposed by nature at so great a distance, and are not nearer one another, such that from one a passage might be made to another; and thence a reason is taken why there ought not to be worlds, as it were, in the circumference of the ether, or near such a void wherein is no power, virtue, or operation; because on one side they could not take life and light.

Fourth, how local distance changes the nature of a body, and how not; and whence it is that, a stone being placed equidistant from two earths, it would either stand still, or determine to move rather to the one than to the other. Fifth, how much Aristotle deceives himself in that, in bodies however distant, he understands an impulse of gravity or levity of the one toward the other; and whence proceeds the appetite of preserving oneself in the present being, however ignoble — which appetite is the cause of flight and pursuit. Sixth, that rectilinear motion neither befits nor can be natural to the earth or other principal bodies, but to the parts of these bodies, which move to them from every difference of place, if they be not very far off. Seventh, from the comets an argument is taken that it is not true that the heavy body, however far off, has impulse or motion toward its container; which reasoning runs not by the true physical principles, but from the suppositions of Aristotle's philosophy. Eighth, apropos of another argument, it is shown how the simple bodies of the same species in other innumerable worlds likewise move; and how numerical diversity posits diversity of places, and each part has its own middle and refers to the common middle of its whole — which middle is not to be sought in the universe.

Ninth, it is determined that bodies and their parts have no determined up and down, save inasmuch as the place of converse is here or there. Tenth, how motion is infinite, and what movable tends to the infinite and to innumerable compositions; and that not for this does gravity or levity follow with infinite velocity; and that the motion of the proximate parts, inasmuch as they keep their being, cannot be infinite; and that the impulse of parts toward their container cannot be save within the region of that container.

Argument of the Fifth Dialogue

At the beginning of the fifth dialogue there presents himself one endowed with a happier wit; who, though nourished in the contrary doctrine, yet — having power to judge upon what he has heard and seen — can make difference between one discipline and another, and easily corrects himself and gives way. It is told who they are to whom Aristotle seems a miracle of nature:

namely, that those who understand him ill, and are of low wit, think magnificently of him. Wherefore we ought to have compassion on such, and flee their disputation, since with them there is nothing to be had but loss. Here Albertino, a new interlocutor, brings twelve arguments, in which consists the whole contrary persuasion against the plurality of worlds. The first is taken from this, that outside the world is understood neither place, nor time, nor void, nor body simple or composite. The second, from the unity of the mover. The third, from the places of movable bodies. The fourth, from the distance of the horizons from the middle. The fifth, from the contiguity of several orbicular worlds. The sixth, from the triangular spaces they cause by their contact. The seventh, from the infinite-in-act, which is not, and from a determinate number, which is no more reasonable than another — from which reason we may infer, with great advantage, that the number ought rather to be infinite. The eighth, from the determination of natural things and from their passive power, which does not answer to the divine active power: but here it is to be considered how unfitting it is that the First and Highest should be like one who has the skill to play the cithara and, for want of a cithara, does not play; and be one who can do, yet does not, because that which he can do cannot be done by him — which sets a more than open contradiction. The ninth, from the civil goodness that consists in converse. The tenth, that by the contiguity of one world with another it follows that the motion of the one hinders the motion of the other. The eleventh, that if this world is complete and perfect, it is not fitting that another be added to it. These are those doubts and motives, in the solution of which consists as much doctrine as alone suffices to discover the inmost and radical errors of the vulgar philosophy, and the weight and moment of ours.

Behold here the reason why we ought not to fear that anything should flow away, that any particular thing should be dispersed, or annihilated, or diffused into a void that should dismember it into nothing. Behold the reason of the vicissitudinal change of the whole, by which there is no evil from which one does not escape, no good upon which one does not light, while through the infinite field, through perpetual change, all substance perseveres the same and one. From which contemplation, if we be attentive to it, it will come to pass that no strange accident shall cast us down through grief or fear, and no

fortune carry us away through pleasure or hope: whence we shall have the true way to true morality; we shall be magnanimous, despisers of what childish thoughts esteem; and we shall come to be greater than those gods whom the blind vulgar adores — for we shall become true contemplators of the history of nature, which is written in ourselves, and regulated executors of the divine laws engraved in the centre of our heart. We shall know that to fly hence to heaven is no other than to fly from heaven hither; that to ascend from here yonder is no other than to ascend from yonder hither; nor is there other descending from the one term to the other. We are no more circumferential to them than they to us; they are no more centre to us than we to them; we no otherwise tread upon the star and are comprehended by the heaven, than they. Behold us, then, beyond envy; behold us free from vain anxiety and foolish care to crave afar that great good which we possess near and at hand. Behold us freer from the greater fear that they should fall upon us, than set in the hope that we should fall upon them; for so does infinite air sustain this globe as those; so does this free animal course through its space and possess its region, as each of those others through its own. Which, when we have considered and comprehended, oh, to how much more considering and comprehending shall we betake ourselves! Whence by means of this science we shall surely obtain that good which through the others is vainly sought.

This is that philosophy which opens the senses, contents the spirit, magnifies the intellect, and brings man back to the true beatitude that he can have as man; for it frees him from the anxious care of pleasures and the blind feeling of pains; it makes him enjoy the present being, and neither fear nor hope overmuch of the future. For the providence, or fate, or fortune that disposes of the vicissitude of our particular being does not will that we should know more of the one than we are ignorant of the other, at first encounter rendering us doubtful and perplexed. But while we consider more profoundly the being and substance of that wherein we are immutable, we shall find that there is no death — not only for us, but for no substance; while nothing is substantially diminished, but all, coursing through infinite space, changes its countenance. And because we are all subject to a best efficient, we ought not to believe or hope otherwise than that, as all is from the good, so all is good, through good and to good.

We fear not that what is accumulated in this world should, by the vehemence of some wandering spirit or the disdain of some thundering Jove, be scattered beyond this tomb or cupola of the heaven, or be shaken out like dust beyond this starry mantle; nor that the nature of things should otherwise come to be annihilated in substance than — to the appearance of our eyes — that air which was enclosed within the concavity of a bubble goes to nothing. For a world is known to us in which thing ever succeeds to thing, without any ultimate depth whence, as from the hand of the smith, they should irreparably vanish into nothing. There are no ends, bounds, margins, or walls that defraud us of the infinite store of things. Therefore fertile is the earth and its sea; therefore perpetual is the blaze of the sun, food being eternally supplied to the voracious fires and humours to the attenuated seas; for from the infinite, ever new store of matter is born beneath. So that Democritus and Epicurus, who would have all renew and restore itself to infinity, understood better than he who would force himself to save the constancy of the universe eternal — that the same number ever succeed the same, and the same parts of matter ever convert into the same.

Now provide, my lords astrologers, with your servile physicists, for those circles of yours that describe the imagined nine movable spheres; with which you come to imprison your brains, so that you present yourselves to me as so many parrots in a cage, while I see you wandering, hopping, and turning within them. We know that so great an Emperor has no seat so strait, no throne so wretched, no court so scanty, no image so feeble, that a phantasm should bring it forth, a dream shatter it, a chimera disperse it — that with a breath it should be filled and with a draught be drained; but it is a most great portrait, a wonderful image, an exalted figure, a most high vestige, an infinite representing of an infinite represented, a spectacle befitting the excellence of Him who cannot be grasped, comprehended, or apprehended. Thus is magnified the excellence of God; thus is made manifest the greatness of His empire: He is glorified not in one, but in suns innumerable; not in one earth, one world, but in ten hundred thousand — I say, in infinite worlds. So that this power of the intellect is not vain, which ever would and can add space to space, mass to mass, unity to unity, number to number, by that science which looses us from the chains of a most narrow realm and promotes us to the

liberty of a most august empire; which takes us from imagined poverty to the innumerable riches of so great a space, of so worthy a field, of so many most cultivated worlds; and suffers not that a circle of the horizon — feigned by the eye upon the earth and imagined by the fancy in the spacious ether — should imprison the spirit under the wardship of a Pluto and the mercy of a Jove.

Meanwhile, though I am certain there is no need to commend him to you, I will not fail — to do part of my duty — to procure that there be truly commended to you one whom you keep among your familiars not as a man of whom you have need, but as a person who has need of you. For, in having about you many who serve you, you are no different from plebeians and merchants; but in having someone in some sort worthy to be by you promoted and defended, you are, as you have ever shown yourself, conformable to those magnanimous princes, heroes, and gods who have ordained men like you for the defence of their friends. And I remind you of what I know needs no reminding: that you will not, in the end, be so esteemed by the world and gratified by God for being loved by princes however great of the earth, as for loving, defending, and preserving one such man. For there is nothing those who by fortune are above you can do for you that may last longer than your walls and tapestries; but such a thing can you do for another as may easily come to be written in the book of eternity — whether that which is seen on earth, or that other which is believed in heaven: seeing that what you receive from others is a testimony of another's virtue, but what you do for another is an express token of your own. Farewell.

Three Sonnets

The three poems Bruno set before the dialogues.

I

My solitary flight, toward those regions
to which you once directed your high thought,
mount to the infinite, since now the task

must match its arts and labours to its object.
Be born again up there; up there go rear
your lovely fledglings, now that cruel Fate
has run its whole course out against the enterprise
from which it once was wont to draw you back.
Go forth from me — a nobler dwelling-place
I would have you enjoy; you shall have for guide a god
whom he that nothing sees has called the blind.⁴
May Heaven keep you, and may every power
of this vast Architect be ever kind to you;
and come not back to me, unless you are mine.

II

Come forth from the strait and blackened prison
where error held me bound so many years,
here I leave the chain that the hand
of my envious and savage foe had clasped about me.
To deliver me to the murky night and dark
she shall no longer have the power; for He who slew
the great Python, and with its blood once dyed
the waters of the sea, has driven off my Fury.⁵
To you I turn and rise, my quickening voice:
I thank you, O my sun, my divine light;
to you I consecrate my heart, exalted hand,
who called me back from that atrocious clawing,
who made yourself my guide to better chambers,
who gave my bruised heart its soundness again.

III

Who gives me wings? who warms my heart within?
Who makes me fear not fortune nor yet death?
Who broke the chains, and burst those very gates
whence few are loosed and ever issue forth?
The ages, years, the months, the days, the hours —
the daughters and the weapons of old Time —
and that high court 'gainst which nor iron nor
diamond avails, have made me safe from its fury.
Henceforth I spread sure wings unto the air;
I fear no barrier of crystal or of glass,
but cleave the heavens, and to the infinite I rise.
And while from my own globe to the rest I mount,
and through the ethereal field press ever on,
that which the rest see far, I leave behind.
HERE BEGIN THE DIALOGUES

The First Dialogue

Elpino · Filoteo · Fracastorio · Burchio

ELPINO. How is it possible that the universe be infinite?

FILOTEO. How is it possible that the universe be finite?

ELPINO. Do you hold that this infinitude can be demonstrated?

FILOTEO. Do you hold that this finitude can be demonstrated?

ELPINO. What is this expanse?

FILOTEO. What is this boundary?

FRACASTORIO. Ad rem, ad rem, si iuvat— to the matter, to the matter, if you please; too long have you held us in suspense.

BURCHIO. Come quickly to some argument, Filoteo, for I shall take my sport in hearing this fable, or fantasy.

FRACASTORIO. Modestius, Burchio — more modestly: what will you say, if the truth should convince you in the end?

BURCHIO. This, even were it true, I would not believe; for this infinite cannot possibly be grasped by my head nor digested by my stomach. Though, to tell the truth, I should rather it were as Filoteo says— because, if by ill luck it befell me to tumble out of this world, I should always find some country to fall into.

ELPINO. Certainly, Filoteo, if we will make sense the judge, or even grant it that primacy which befits it inasmuch as all knowledge takes its origin from it, we shall perhaps find that it is no easy thing to discover a means to conclude what you say, rather than the contrary. Now, if it please you, begin to make me understand.

FILOTEO. There is no sense that beholds the infinite; there is no sense of which this conclusion may be required, for the infinite cannot be an object of sense. And therefore whoever asks to know this by way of sense is like one who would see with his eyes the substance and the essence; and whoever should on this account deny the thing, because it is neither sensible nor visible, would come to deny his own substance and being. There must, then, be measure in demanding the testimony of sense, to which we grant authority only in sensible things — and even there not without suspicion, unless it come to judgment joined with reason. To the intellect it belongs to judge and to render account of things absent and divided by distance of time and interval of place. And in this we have enough, and sufficient testimony, from sense, in that it is not able to contradict us; nay, it makes evident and confesses its own weakness and insufficiency by that appearance of finitude which its horizon occasions, in the forming whereof one sees, moreover, how inconstant it is. For, as we know by experience that it deceives us upon the surface of this globe whereon we find ourselves, so much the more ought we to hold it in suspicion as to that bound which it makes us apprehend in the starry vault.

ELPINO. To what end, then, do the senses serve us? Tell me.

FILOTEO. To excite the reason only; to accuse, to indicate, and to testify in part— not to testify in full, still less to judge, nor to condemn. For never, however perfect, are they without some perturbation. Whence truth is from the senses in small part, as from a feeble beginning, but is not in the senses.

ELPINO. Where, then?

FILOTEO. In the sensible object as in a mirror; in the reason by way of argument and discourse; in the intellect by way of principle or of conclusion; in the mind in its own and living form.

ELPINO. Up, then, and make your arguments.

FILOTEO. So I shall. If the world is finite, and outside the world is nothing, I ask you: where is the world? where is the universe? Aristotle answers: it is in itself. The convex of the first heaven is the universal place; and that, as the first container, is not in another container, because place is nothing other than the surface and extremity of a containing body; so that whoso has no containing body has no place. Now what do you mean, Aristotle, by this — that “place is in itself”? what will you conclude to me as to “that which is outside the world”? If you say that there is nothing there, then the heaven, the world, surely will be in no part whatsoever; —

FRACASTORIO. Nullibi ergo erit mundus. Omne erit in nihilo.¹

FILOTEO. — the world will be something that is nowhere to be found. If you say (as it certainly seems to me you must mean something, in order to flee the void and the nothing) that outside the world is an intellectual and divine being, so that God comes to be the place of all things, you yourself will be sorely embarrassed to make us understand how a thing incorporeal, intelligible, and without dimension can be the place of a thing possessed of dimension. And if you say that He contains it as a form, and after the manner whereby the soul contains the body, you do not answer to the question of the “outside,” nor to the demand for that which is found beyond and without the universe. And if you would excuse yourself by saying that where there is nothing, and where there is no thing at all, there is no place either, nothing beyond, nothing “outside” — by this you will not content me; for these are words and excuses that cannot enter into thought. For it is utterly impossible that, by any sense or fancy (even were other senses and other fancies to be found), you could make me affirm, with true conviction, that there is found such a surface, such a margin, such an extremity, beyond which is neither body nor void— even granting God to be there; for the divinity is not there to fill the void, and consequently is not, in that respect, in any wise that which bounds the body, since whatever is said to bound a thing is either an exterior

form or a containing body. And in whatsoever way you would say it, you would be held a disparager of the dignity of the divine and universal nature.

BURCHIO. Surely, I think one would have to tell this fellow that, if a man stretched his hand beyond that convex, the hand would come to be in no place, would be in no part at all, and consequently would have no being.

FILOTEO. To this I add that there is no wit that does not conceive this Peripatetic saying as an implicit contradiction. Aristotle defined place not as a containing body, not as a certain space, but as a surface of a containing body; and then the first and principal and greatest place is precisely that to which such a definition least— nay, not at all — agrees. That is the convex surface of the first heaven, which is the surface of a body, and of such a body as only contains and is not contained. Now, for that surface to be a place, it is not required that it be of a contained body, but that it be of a containing body. If it is the surface of a containing body, and is not joined and continued to a contained body, it is a place without anything placed in it; seeing that to the first heaven it belongs not to be a place save by its concave surface, which touches the convex of the second. Behold, then, how that definition is vain, and confused, and destructive of itself: to which confusion one comes through holding that untenable position, that beyond the heaven is set nothing.

ELPINO. The Peripatetics will say that the first heaven is a containing body by its concave surface, and not by its convex; and according to that, it is a place.

FRACASTORIO. And I add that there is thus found a surface of a containing body which is not a place.

FILOTEO. In sum, to come directly to the point, it seems to me a ridiculous thing to say that outside the heaven is nothing, and that the heaven is in itself, and placed by accident, and a place by accident — that is, by its parts. And let it mean what it will, this “by accident”; it cannot escape making two out of one, for that which contains and that which is contained are ever one thing and another; and so much one and another that, by his own account, the container is incorporeal and the contained is body; the container immovable, the contained movable; the container mathematical, the contained physical.

Now let that surface be what it will, I shall constantly ask: what is beyond it? If it be answered, “nothing,” this I shall call void, an emptiness; and such a void and emptiness as has no mode nor any further bound — bounded, however, on the hither side. And this is harder to imagine than to think the universe infinite and immense; for we cannot escape the void, if we will posit the universe finite. Let us see now whether it be a fitting thing that there be such a space wherein is nothing. In this infinite space is found this universe (whether by chance, or by necessity, or by providence, I trouble not myself now to say). I ask whether this space, which contains the world, has any greater aptitude to contain a world than another space that may be beyond.

FRACASTORIO. Surely it seems to me not; for where there is nothing, there is no difference; where there is no difference, there is not one aptitude and another; and perhaps there is no aptitude at all where there is no thing at all.

ELPINO. Nor any unfitness either; and of the two, I would sooner [hold] the one than the other.

FILOTEO. You say well. So I say that, as the void and emptiness (which this Peripatetic saying necessarily posits) has no aptitude whatsoever to receive, far less ought it to have any to repel the world. But of these two aptitudes we see the one in act, and the other we cannot see at all, save with the eye of reason. As, then, in this space, equal to the magnitude of the world (which by the Platonists is called matter), is this world, so another may be in that space, and in innumerable spaces beyond this, equal to this.

FRACASTORIO. Surely we may judge more safely after the likeness of what we see and know, than in a manner contrary to what we see and know. Whence, because by our seeing and our experience the universe does not come to an end, nor terminate in void and emptiness— and of that we have no report— we ought reasonably to conclude thus; for, when all other reasons were equal, we see that experience is contrary to the void and not to the plenum. Saying this, we shall ever be excused; but saying otherwise, we shall not easily flee a thousand accusations and difficulties. Proceed, Filoteo.

FILOTEO. Therefore, on the side of infinite space, we know for certain that there is an aptitude for the reception of body, and we know nothing to the contrary. Yet it will suffice me to hold that body is not repugnant to it; at the

least for this cause, that where there is nothing, nothing gives offence. It remains now to see whether it be a fitting thing that all space be full, or no. And here, if we consider both what it can be and what it can do, we shall ever find it not only reasonable, but even necessary, that it be. That this may be manifest, I ask you: is it good that this world be?

ELPINO. Very good.

FILOTEO. Then it is good that this space, which is equal to the dimension of the world (which I will call void, like and indifferent to the space that you would say is nothing beyond the convexity of the first heaven), be thus filled.

ELPINO. So it is.

FILOTEO. Further, I ask you: do you believe that, as in this space is found this engine, called the world, the same could have been, or could be, in another space of this emptiness?

Elpino. I will say yes— though I do not see how, in the nothing and the void, we can speak of a difference of one place and another.

Fracastorio. I am sure you do see it, but you dare not affirm it, because you perceive whither he means to lead you.

ELPINO. Affirm it, then, with assurance; for it is needful to say and to understand that this world is in a space which, were the world not, would be indifferent from that which is beyond your first mobile.

FRACASTORIO. Proceed.

FILOTEO. Therefore, as this space can be, and has been able to be, and is necessarily perfected by the containment of this universal body (as you say), no less can all the other space be, and have been able to be, perfected.

Elpino. I grant it; but what of that? It can be, it can have: therefore it is? therefore it has?

Filoteo. I shall so contrive that, if you will candidly confess, you shall say that it can be, and that it must be, and that it is. For as it were an evil that this space were not full — that is, that this world were not— no less, by reason of indifference, is it an evil that all space be not full; and consequently the universe shall be of infinite dimension, and the worlds shall be innumerable.

ELPINO. The cause why they must be so many— and why one does not suffice?

FILOTEO. Because, if it be an evil that this world should not be, or that this plenum should not be found, is it so with regard to this space, or to another space equal to this?

Elpino. I say it is an evil with regard to that which is in this space, which might indifferently be found in another space equal to this.

FILOTEO. This, if you consider well, comes all to one; for the goodness of this corporeal being, which is in this space (or might be in another equal to this), accounts only for, and regards only, that fitting goodness and perfection which can be in such and so much space as this, or another equal to this, and not that which can be in innumerable other spaces like this. So much the more in that, if there is reason that there be a finite good, a bounded perfection, beyond all proportion is there reason that there be an infinite good; because, where the finite good is by fitness and reason, the infinite is by absolute necessity.

ELPINO. The infinite good certainly is, but it is incorporeal.

FILOTEO. In this we are agreed, as touching the incorporeal infinite. But what is it that makes the good, the being, the corporeal infinite, not most fitting? Or what is repugnant in this — that the infinite, implied in the most simple and indivisible first principle, be unfolded rather in this its infinite and unbounded image, most capacious of innumerable worlds, than be unfolded within margins so narrow, so that it seems a reproach not to think that this body, which to us appears vast and exceeding great, is, with respect to the divine presence, but a point— nay, a nothing?

ELPINO. As the greatness of God in no wise consists in corporeal dimension (I leave aside that the world adds nothing to Him), so we ought not to think that the greatness of His image consists in the greater or lesser bulk of dimensions.

FILOTEO. You say very well, but you answer not to the nerve of the argument; for I require not infinite space, nor has Nature infinite space, for the dignity of dimension or of corporeal bulk, but for the dignity of the

natures and corporeal species— because incomparably better is infinite excellence presented in innumerable individuals than in those that are numerable and finite. Therefore it is needful that of an inaccessible divine countenance there be an infinite image, wherein, as infinite members, are found innumerable worlds, such as are the others. Therefore, by reason of the innumerable degrees of perfection which must unfold the incorporeal divine excellence in a corporeal mode, there must be innumerable individuals, which are these great animals (whereof one is this earth, divine mother, who has brought us forth and nourishes us, and who will yet take us back again); and for the containing of these innumerable worlds an infinite space is required. No less, then, is it good that there be, as there can be, innumerable worlds like this one, as this one has been able and is able to be, and as it is good that this one be.

ELPINO. We will say that this finite world, with these finite stars, comprises the perfection of all things.

FILOTEO. You may say it, but you cannot prove it; for the world that is in this finite space comprises the perfection of all those finite things that are in this space, but not of the infinite things that can be in other innumerable spaces.

FRACASTORIO. Of your grace, let us pause, and not do as the sophists, who dispute to conquer, and who, while they gaze upon their own palm, hinder both themselves and others from grasping the truth. Now I believe there is no caviller so obstinate as to wish further to wrangle that, by reason of the space which can infinitely contain, and by reason of the individual and numerical goodness of the infinite worlds that can be contained no less than this one we know, each of them has reason fittingly to be. For infinite space has infinite aptitude, and in that infinite aptitude is praised an infinite act of existence; whereby the infinite efficient is not held deficient, and whereby the aptitude is not in vain. Be content, then, Elpino, to hear other reasons, if others occur to Filoteo.

ELPINO. To tell the truth, I see well that to call the world— or, as you say, the universe— unbounded carries with it no inconvenience, and frees us from innumerable straits wherein we are entangled by the contrary doctrine. I

recognize in particular that with the Peripatetics we must sometimes say things that have no foundation whatsoever in our own meaning: as, having denied the void both without and within the universe, we yet wish to answer the question that asks where the universe is, and to say that it is in its own parts, for fear of saying that it is in no place at all — as one says *nullibi, nusquam*. But it cannot be avoided that, in that way, we must say the parts are found in some place, and that the universe is in no place nor in any space; which saying, as every one sees, can be founded upon no meaning at all, but signifies expressly an obstinate flight, that we may not confess the truth by positing the world and universe infinite, or by positing space infinite— from both which positions follows a twofold confusion to him that holds them. I affirm, then, that if the All is a body, and a spherical body, and consequently figured and bounded, it must be bounded within an infinite space; wherein, if we will say that there is nothing, it is necessary to grant that there is the true void— which, if it be, has no less reason in the whole than in this part which here we see capable of this world; and if it be not, then there must be the plenum, and consequently the universe infinite. And no less insipidly does it follow that the world is somewhere (*alicubi*), having said that outside it is nothing and that it is in its own parts, than if one should say that Elpino is somewhere because his hand is upon his arm, his eye in his face, his foot upon his leg, his head upon his trunk. But, to come to the conclusion, and not to play the sophist by fastening upon apparent difficulties and spending the time in idle talk, I affirm what I cannot deny: namely, that in infinite space either there could be infinite worlds like this one, or else this universe extends its capacity and comprehension over many bodies such as these we name stars; and further, that (whether these worlds be like or unlike) the being of the one would be no less reasonable than the being of the other; for the being of the other has no less reason than the being of the one, and the being of many no less than that of one and of another, and the being of infinite no less than that of many. Wherefore, as it would be an evil that this world should be abolished and not be, so it would be no good that innumerable others should not be.

FRACASTORIO. You explain yourself very well, and show that you understand the reasons well and are no sophist, since you accept what cannot be denied.

ELPINO. Yet I would hear what remains of the argument from the eternal principle and efficient cause: whether to it there befits this effect of so infinite a kind, and whether therefore in fact such an effect there be.

FILOTEO. This is what I had to add. For, having said that the universe must be infinite by the capacity and aptitude of infinite space, and by the possibility and fitness of the being of innumerable worlds like this one, it remains now to prove it from the circumstances of the efficient that must have produced it such — or, to speak better, must produce it ever such — and from the condition of our manner of understanding. We can more easily argue that infinite space is like to this which we see, than argue that it is such as we do not see, neither by example, nor by likeness, nor by proportion, nor even by any imagination that in the end destroys not itself. Now, to begin: why should we wish, or be able, to think that the divine efficacy is idle? Why should we wish that the divine goodness, which can communicate itself to infinite things, and can infinitely diffuse itself, should choose to be niggardly, and to draw itself in to nothing— seeing that every finite thing is, with respect to the infinite, nothing? Why would you have that centre of divinity, which can amplify itself infinitely into an infinite sphere (if so one might speak), remain rather sterile, as it were envious, than make itself communicable, a fruitful father, adorned and fair? Why should it rather communicate itself diminishingly, or (to speak better) not communicate itself, than according to the measure of its glorious power and being? Why must the infinite capacity be frustrated, the possibility of infinite worlds that can be defrauded, the excellence of the divine image prejudiced — that image which ought rather to shine forth in an uncontracted mirror, infinite and immense, according to its mode of being? Why must we affirm this, which, once posited, draws after it so many inconveniences, and— without furthering laws, religions, faith, or morality in any wise— destroys so many principles of philosophy? How would you have that God, whether as to power, or as to operation, or as to effect (which in Him are the same thing), be determined, and as it were the bound of the convexity of a sphere, rather than (as one may say) the unbounded bound of an unbounded thing? A bound, I say, without bound— the infinity of the one being different from the infinity of the other; for He is the whole infinite complicately and totally, but the universe is the whole in the whole (if indeed a totality may be spoken of, where

there is neither part nor end) explicately, and not totally; whereby the one has the character of a bound, the other of the bounded— not by difference of finite and infinite, but because the one is infinite and the other is finiting, according to the manner of the total and the totally being in all that which, though it be wholly infinite, is not yet totally infinite; for this is repugnant to dimensional infinity.

Elpino. I would better understand this. Wherefore do me the pleasure to explain yourself somewhat upon what you say— being “wholly in all totally,” and “wholly in all infinite and totally infinite.”

Filoteo. I call the universe wholly infinite, because it has no margin, bound, nor surface; I say the universe is not totally infinite, because each part that we can take of it is finite, and of the innumerable worlds it contains, each is finite. I call God wholly infinite, because He excludes from Himself every bound, and each of His attributes is one and infinite; and I call God totally infinite, because the whole of Him is in all the world, and in each part thereof infinitely and totally— contrary to the infinity of the universe, which is totally in the whole, and not in these parts (if indeed, with reference to the infinite, they can be called parts) which we can comprehend therein.

Elpino. I understand. Now follow your purpose.

FILOTEO. By all the reasons, then, for which this world, comprised as finite, is said to be fitting, good, and necessary, all the other innumerable worlds must be said to be fitting and good; to which, by the same reason, the Omnipotence does not envy being; and without which that Omnipotence would come to be blamed, whether for not willing or for not being able, for leaving a void— or, if you will not say void, an infinite space— whereby there would be withdrawn not only infinite perfection of being, but also infinite actual majesty from the efficient in the things made (if they be made), or dependent (if they be eternal). What reason would have us believe that the agent who can make an infinite good makes it finite? And if He makes it finite, why ought we to believe that He could make it infinite, the power and the act being in Him all one? For, being immutable, He has no contingency in operation, nor in efficacy; but from a determinate and certain efficacy depends a determinate and certain effect, immutably; whence He cannot be

other than what He is; cannot be such as He is not; cannot have power for other than that whereof He has power; cannot will other than what He wills; and necessarily cannot do other than what He does — seeing that to have power distinct from act belongs only to mutable things.

FRACASTORIO. Surely, that which never was, is not, and never shall be, is no subject of possibility or of power; and truly, if the first efficient cannot will other than what it wills, it cannot do other than what it does. And I see not how some understand what they say of an infinite active power to which no infinite passive power corresponds, and that He should make one and finite who can make innumerable in the infinite and immense — His action being necessary, because it proceeds from a will which, being most immutable, nay immutability itself, is likewise necessity itself; whence liberty, will, and necessity are altogether one same thing, together with the doing, with the willing, the being able, and the being.

FILOTEO. You consent, and say very well. We must then say one of two things: either that the efficient, since an infinite effect can depend upon Him, is to be acknowledged as the cause and principle of an immense universe that contains innumerable worlds (and from this follows no inconvenience at all, but rather all that is fitting, both according to science and according to the laws and the faith); or else that, a finite universe depending upon Him, with these worlds (which are the stars) of determinate number, He is known to be of finite and determinate active power, as the act is finite and determinate; for such as the act is, such is the will, and such the power.

Fracastorio. I frame and set in order a pair of syllogisms, on this wise. The first efficient, if it could will other than what it wills, could do other than what it does; but it cannot will to do other than what it wills to do; therefore it cannot do other than what it does. Therefore, whoso says the effect finite, posits the operation and the power finite. Again (which comes to the same): the first efficient cannot do save what it wills to do; it wills not to do save what it does; therefore it cannot do save what it does. Therefore, whoso denies the infinite effect, denies the infinite power.

FILOTEO. These, if they be not simple, are demonstrative syllogisms. Yet I commend that certain worthy divines do not admit them; for, considering

providently, they know that the rude and ignorant peoples, by this necessity, come to be unable to conceive how election, and dignity, and the merits of justice can stand; whence, trusting or despairing under a kind of fate, they become of necessity most wicked. As at times certain corrupters of laws, faith, and religion, wishing to seem wise, have infected so many peoples, making them more barbarous and wicked than they were before, despisers of well-doing, and most assured in every vice and villainy, by reason of the conclusions they draw from such premises. Therefore the contrary doctrine, among the wise, is not so much scandalous, nor does it detract from the divine greatness and excellence, as that which is true is pernicious to civil intercourse and contrary to the end of the laws— not for being true, but for being ill understood, as well by those who maliciously handle it as by those who are not capable of understanding it without harm to their morals.

FRACASTORIO. True. There was never found philosopher, learned man, and good man, who under any species or pretext would have wished to draw from such a proposition the necessity of human acts, and to destroy election. As, among others, Plato and Aristotle, in positing necessity and immutability in God, do no less posit moral liberty and the faculty of our election; for they well know, and can comprehend, how this necessity and this liberty are compossible. Wherefore certain true fathers and pastors of peoples do perhaps put away this saying, and the like, that they may not give occasion to wicked men and seducers, enemies of civility and of the general profit, to draw their grievous conclusions, abusing the simplicity and ignorance of those who can hardly grasp the truth, and are most readily inclined to evil. And they will easily pardon us for using the true propositions, from which we would infer nothing but the truth of Nature and the excellence of its Author — propositions not set forth by us before the vulgar, but before the wise alone, who can have access to the understanding of our discourses. From this principle it comes that the divines, no less learned than religious, have never prejudiced the liberty of the philosophers; and the true, civil, and well-mannered philosophers have ever favoured the religions: because both the one and the other know that faith is required for the instruction of rude peoples that must be governed, and demonstration for the contemplative, who know how to govern themselves and others.

ELPINO. Touching this protestation, enough is said. Return now to the matter.

FILOTEO. To come, then, to infer what we would, I say that, if in the first efficient there be infinite power, there is also an operation whereon depends a universe of infinite magnitude, and worlds infinite in number.

ELPINO. What you say contains in itself great persuasion, if it contain not the truth. But this, which seems to me very probable, I will affirm for true, if you can resolve me of one most weighty argument, whereby Aristotle was brought to deny the divine power to be infinite intensively, though he conceded it to be so extensively. The reason of his denial was this: that, power and act being in God the same thing, He, being able thus to move infinitely, would move infinitely with infinite vigour; the which, were it true, the heaven would come to be moved in an instant; for if the stronger mover moves the more swiftly, the strongest moves most swiftly, and the infinitely strong moves instantaneously. The reason of his affirmation was, that He eternally and regularly moves the first mobile, according to that measure and proportion wherewith He moves it. See, then, for what reason he attributes to Him extensive infinity — but not absolute infinity— and intensively also. Wherefore I would conclude that, as His infinite motive power is contracted to the act of motion according to a finite velocity, so the same power of making the immense and the innumerable is limited by His will to the finite and the numerable. Almost the same do certain divines hold, who, besides that they concede the extensive infinity wherewith He successively perpetuates the motion of the universe, require also the intensive infinity wherewith He can make innumerable worlds, move innumerable worlds, and move each of them and all of them together in one instant: yet has He so tempered, by His will, the quantity of the multitude of innumerable worlds, as the quality of the most intense motion. Where, as this motion, which proceeds indeed from infinite power, is nonetheless known to be finite, so easily may the number of mundane bodies be believed determinate.

FILOTEO. The argument is, in truth, of greater persuasion and show than any other can be; concerning which enough has already been said, in that the divine will is held to be the regulator, modifier, and limiter of the divine

power. Whence follow innumerable inconveniences, according to philosophy at least— I leave aside the theological principles, which nonetheless will not admit that the divine power be more than the divine will or goodness, or, in general, that one attribute belong to the divinity by greater reason than another.

ELPINO. Why, then, have they that manner of speaking, if they have not this manner of understanding?

FILOTEO. For penury of terms and of effectual resolutions.

ELPINO. Now then, you, who have particular principles whereby you affirm the one thing— namely, that the divine power is infinite intensively and extensively, and that act is not distinct from power, and that for this the universe is infinite and the worlds innumerable — and yet deny not the other, that in fact each of the stars or orbs (as you please to call them) is moved in time and not in an instant: show by what terms and with what resolution you come to save your own, or to take away the persuasions of others, whereby they judge, in conclusion, the contrary of what you judge.

FILOTEO. For the resolution of what you seek, you must mark, first, that the universe being infinite and immobile, there is no need to seek a mover of it. Secondly, that, the worlds contained in it being infinite — such as the earths, the fires, and other species of bodies called stars— all move from the inward principle, which is their own soul (as in another place we have proved); and therefore it is vain to go investigating their extrinsic mover. Thirdly, that these mundane bodies move in the ethereal region, not affixed or nailed to any body, any more than this earth (which is one of them) is affixed; the which earth, nevertheless, we prove to circle its own centre, in divers manners, and to circle the sun, by an inward animal instinct. These advertisements being set down according to our principles, we are not forced to demonstrate an active or passive motion of intensively infinite virtue; for the movable and the mover are infinite [only as a whole], while the moving soul and the moved body concur in a finite subject — in each, I say, of the said mundane stars. So that the first principle is not that which moves; but, quiet and immobile, gives the power of moving to infinite and innumerable worlds, great and small animals set in the most ample region of the universe; of which each, according to the

condition of its own virtue, has the principle of mobility, of motivity, and of other accidents.

ELPINO. You are much fortified; but not for this do you cast down the engine of the contrary opinions, which all hold as famous and as presupposed that the Best and Greatest moves the whole. You say that He gives the power of moving to the whole that moves, and that therefore the motion happens according to the virtue of the proximate mover. Certainly this your saying seems to me rather more reasonable, and less unfitting, than the common determination. Yet— by what you are wont to say touching the soul of the world and the divine essence, which is wholly in all, fills all, and is more intrinsic to things than is their own proper essence, because it is the essence of essences, the life of lives, the soul of souls — therefore it seems to me that we may no less say that He moves the whole than that He gives to the whole the moving. Whence the doubt already raised seems still to stand upon its feet.

FILOTEO. And in this I can easily satisfy you. I say, then, that in things there are to be contemplated, if so you will, two active principles of motion: the one finite, according to the measure of the finite subject, and this moves in time; the other infinite, according to the measure of the soul of the world— or rather of the divinity, which is as it were the soul of the soul, which is wholly in all, and makes the soul to be wholly in all — and this moves in an instant. The earth, therefore, has two motions.

(Here, in the original, stands a figure of the earth, lettered A, E, I, V, K, O, illustrating what follows.)

FILOTEO. So all bodies that move have two principles of motion; whereof the infinite principle is that which, at once and together, moves and has moved; whence, according to that account, the movable body is no less most stable than most mobile. As appears in the present figure, which I would signify the earth: which is moved in an instant inasmuch as it has a mover of infinite virtue. That earth, moving with its centre from A to E, and returning from E to A— and this being in one instant— is at once and together in A and in E, and in all the places between; and therefore at once it has departed and returned; and this being ever so, it comes to pass that it is ever most stable. Likewise, as to its motion about the centre, where its east is I, its midday V, its

west K, its midnight O — each of these points circles by virtue of an infinite impulse; and therefore each of them at once has departed and returned, and consequently is ever fixed, and is where it was. So that, in conclusion, for these bodies to be moved by infinite virtue is the same as not to be moved; for to move in an instant, and not to move, are altogether one and the same. There remains, then, the other active principle of motion, which is from the intrinsic virtue, and consequently is in time and a certain succession; and this motion is distinct from rest. Behold, then, how we may say that God moves the whole; and how we ought to understand that He gives the moving to the whole that moves.

ELPINO. Now that you have so loftily and effectually taken from me and resolved this difficulty, I yield me wholly to your judgment, and hope ever henceforth to receive from you the like resolutions; for, though as yet I have but little practised and tried you, I have nonetheless received and conceived much, and hope for much more, to my great advantage. For, though I see not your mind in full, by the ray it sends forth I discern that within is enclosed either a sun, or a yet greater luminary. And from this day forward, not with hope to surpass your sufficiency, but with the design of giving occasion to your elucidations, I will return to set proposals before you— if you will vouchsafe to let yourself be found, for so many days at the same hour in this place, as shall suffice for me to hear and understand so much as may altogether quiet my mind.

FILOTEO. So I shall.

FRACASTORIO. You will be most welcome, and we shall be your most attentive auditors.

BURCHIO. And I, however little understanding, if I understand not the meanings, will listen to the words; if I listen not to the words, I will hear the voice. Farewell!

The Second Dialogue

Interlocutors: Filoteo, Elpino, Fracastorio, Burchio.

PHIL. Because the first principle is most simple, therefore, if according to one attribute it were finite, it would be finite according to all its attributes; or else, being finite according to a certain intrinsic respect and infinite according to another, there would necessarily be understood to be composition in it. If, then, it is the operator of the universe, it is certainly an infinite operator, and regards an infinite effect — an effect, I say, inasmuch as the whole has dependence upon it. Moreover, just as our imagination is able to proceed to infinity, ever imagining magnitude beyond magnitude and number beyond number, according to a certain succession and, as one says, in potency, so must it be understood that God actually understands infinite dimension and infinite number. And from this understanding there follows the possibility, together with the fitness and opportunity, of that which we posit to be: where, as the active power is infinite, so, by necessary consequence, the subject of such power is infinite; for, as we have demonstrated elsewhere, the power to make posits the power to be made, the dimension-giving posits the dimensionable, the dimensioning posits the dimensioned. Add to this that, as there really exist finite dimensioned bodies, so the first intellect understands body and dimension; and if it understands it, it understands it no less infinite; and if it understands it infinite, and body is understood infinite, then necessarily such an intelligible species is; and being produced by such an intellect as the divine, it is most real — and so real that it has a more necessary being than that which is actually before our sensitive eyes. Whence, if you consider well, it comes about that, as there is truly one infinite mostsimple individual, so there is one most-ample infinite dimensional [being], which is in that [individual], and in which that [individual] is, in the manner whereby it is in the whole and the whole is in it. Next, if by corporeal quality we see that a body has the power to increase itself to infinity — as is seen in fire, which, as everyone concedes, would amplify itself to infinity if matter and fuel were brought near it — what reason wills that fire, which can be infinite and can consequently be made infinite, cannot actually be found infinite? Certainly I know not how we can feign there to be in matter something in passive potency that is not in active potency in the efficient, and consequently in act — nay, the very act itself. Certainly, to say that the infinite is in potency and in a certain succession, and not in act, necessarily brings with it that the active

power can set this in successive act and not in completed act; for the infinite cannot be completed. Whence it would follow further that the first cause has not a simple, absolute, and single active power, but one active power to which there answers an infinite successive possibility, and another to which there answers a possibility undistinguished from act. I leave aside that, the world being bounded, and there being no way to imagine how a corporeal thing should come circumferentially to end upon an incorporeal thing, this world would be in the potency and faculty of vanishing and annihilating itself; for, so far as we comprehend, all bodies are dissoluble. I leave aside, I say, that there would be no reason to forbid that at some time the infinite void — though it cannot be conceived as of active power — should absorb this world as a nothing. I leave aside that place, space, and void have likeness with matter, if indeed they be not matter itself; as perhaps not without cause it sometimes seems that Plato, and all those who define place as a certain space, would have it. Now, if matter has its appetite — which ought not to be in vain, since such appetite is of nature and proceeds from the order of the first nature — then place, space, the void must have such an appetite. I leave aside that, as was above hinted, none of these who call the world bounded, after affirming the bound, knows in any way to feign how it is; and at the same time some of these, denying the void and the inane with their statements and words, then by execution and effect come necessarily to posit it. If it is void and inane, it is certainly capable of receiving; and this cannot in any way be denied, seeing that — by that very reason for which it is reckoned impossible that in the space where this world is, another world should at the same time be contained — it must be said possible that in the space outside this world, or in that nothing (if Aristotle so wishes to call that which he will not call void), something can be contained. The reason for which he says two bodies cannot be together is the impossibility of the dimensions of one and another body: it remains, then, so far as such reason requires, that where the dimensions of the one are not, the dimensions of the other can be. If this potency is there, then space is in a certain manner matter; if it is matter, it has the aptitude; if it has the aptitude, for what reason ought we to deny it the act?

ELP. Very well. But, of your grace, proceed to another point; make me understand what difference you make between the world and the universe.

PHIL. The difference is much divulged outside the Peripatetic school. The Stoics make a difference between the world and the universe, because the world is all that is full and consists of solid body; the universe is not only the world, but, besides, the void, the inane, and the space outside it: and therefore they say the world is finite, but the universe infinite. Epicurus likewise calls the all and the universe a mixture of bodies and the inane; and in this he says the nature of the world consists, which is infinite — both in the capacity of the inane and void, and, besides, in the multitude of bodies that are in it. We call nothing “void” as that which is simply nothing; but according to that reason whereby whatsoever is not a body that sensibly resists is wont to be called, if it has dimension, void: seeing that commonly they do not apprehend a thing to be body save by the property of resistance; whence they say that, as that is not flesh which is not woundable, so that is not body which does not resist. In this manner we say there is an infinite — that is, an immense ethereal region, in which are innumerable and infinite bodies, such as the earth, the moon, and the sun; which are by us called worlds composed of plenum and void: for this spirit, this air, this ether, not only is round about these bodies, but also penetrates within them all, and is implanted in everything. We say “void” also according to that reason whereby we answer the question that should ask where the infinite ether and the worlds are; and we should answer: in an infinite space, in a certain bosom in which the all both is and is understood [to be], and which cannot be understood nor be in another.

Now here Aristotle, confusedly taking the void according to these two significations and a third which he feigns and himself knows not how to name or define, goes debating to do away with the void; and thinks, by the same manner of arguing, utterly to destroy all the opinions of the void. Which, however, he touches no more than if, for having taken away the name of some thing, one should think to have taken away the thing; for he destroys, if indeed he destroys, the void according to that reason which perhaps has been taken by no one: seeing that the ancients and we take the void for that in which there can be body, and which can contain something, and in which are the atoms and the bodies; and he alone defines the void as that which is nothing, in which is nothing, and in which there can be nothing. Wherefore, taking the void according to a name and intention in which no one understood it, he

comes to build castles in the air, and to destroy his own void, and not that of all the others who have spoken of the void and have made use of this name “void.” Not otherwise does this sophist in all the other matters — as of motion, the infinite, matter, form, demonstration, being — where he ever builds upon the credit of his own definition and of a name taken according to a new signification. Whence everyone that is not utterly devoid of judgment can easily perceive how superficial this man is concerning the consideration of the nature of things, and how attached he is to his own suppositions — neither granted, nor worthy to be granted — more vain in his natural philosophy than can ever be feigned in mathematics. And see that he so gloried and pleased himself in this vanity that, concerning the consideration of natural things, he so ambitiously desired to be esteemed ratiocinative, or, as we may say, logical, that, by way of reproach, he calls those who have been more solicitous of nature, reality, and truth — “physicists.” Now, to come to ourselves: seeing that in his book *On the Void* he says nothing, directly or indirectly, that can worthily militate against our intention, we leave it so, remitting it perhaps to a more leisurely occasion. Therefore, if it please you, Elpino, frame and set in order those reasons by which the infinite body is not admitted by our adversaries, and after them those by which they cannot comprehend that there are innumerable worlds.

ELP. So I shall do. I shall report Aristotle’s opinions in order, and you shall say concerning them what occurs to you. “It is to be considered,” says he, “whether there is an infinite body, as some of the ancient philosophers say, or whether this be an impossible thing; and next it is to be seen whether there be one or more worlds. The resolution of which questions is most important: for the one and the other part of the contradiction are of such moment that they are the principle of two sorts of philosophizing very diverse and contrary: as, for example, we see that from that first error of those who posited the indivisible parts, they have so closed the road that they come to err in a great part of mathematics. We shall therefore loose a matter of great moment for past, present, and future difficulties; for, however little transgression be made in the principle, it comes to be ten thousand times greater in the progress: as, by similitude, in the error made at the beginning of some journey, which goes on increasing and growing the greater progress is made in departing from the

beginning, so that at last one comes to arrive at a term contrary to that which was proposed. And the reason of this is that principles are small in magnitude and very great in efficacy. This is the reason for the determining of this doubt.”

PHIL. All that he says is most necessary, and no less worthy to be said by others than by him; for, as he believes that from this ill-understood principle the adversaries have run into great errors, so, on the contrary, we believe and see plainly that from the contrary of this principle he has perverted the whole consideration of nature.

ELP. He adds: “It is necessary, then, that we see whether it is possible that there be a simple body of infinite magnitude; which first must be shown impossible in that first body which moves circularly, and next in the other bodies; for, every body being either simple or composite, the composite follows the disposition of that which is simple. If, then, the simple bodies are not infinite, either in number or in magnitude, necessarily such a composite body cannot be [infinite].”

PHIL. He promises very well; for, if he shall prove that the body which is called containing and first is containing, first, and finite, it will be superfluous and vain to prove it afterward of the contained bodies.

ELP. Now he proves that the round body is not infinite. “If the round body is infinite, the lines that depart from the middle will be infinite, and the distance from one semidiameter to another (which, the more they recede from the centre, the greater distance they acquire) will be infinite; for from the addition of the lines according to length, it is necessary that a greater distance follow; and therefore, if the lines are infinite, the distance also will be infinite. Now it is an impossible thing that the movable could traverse an infinite distance: and in circular motion it is needful that a semidiametral line of the movable come to the place of one and another semidiameter.”

PHIL. This reason is good, but it is not to the purpose against the intention of the adversaries. For never was there found one so rude and of so gross a wit as to have posited the world infinite, and an infinite magnitude, and that movable. And he shows himself to have forgotten what he reports in his Physics: that those who posited one infinite being and principle posited it

likewise immovable; and neither he, nor another for him, will ever be able to name any philosopher, or even any ordinary man, who has said that an infinite magnitude is movable. But this man, like a sophist, takes one part of his argumentation from the adversary's conclusion, supposing his own principle — that the universe is movable, nay, that it moves, and that it is of spherical figure. Now see whether, of all the reasons this beggar produces, there be found even one that argues against the intention of those who say there is one infinite, immovable, unfigured, most spacious container of innumerable movables, which are the worlds, called by some “stars” and by others “spheres”; see a little, in this and other reasons, whether he brings forward presuppositions granted by anyone.

ELP. Certainly, all six reasons are founded upon that presupposition — namely, that the adversary should say the universe is infinite, and should grant that that infinite is movable: which is certainly a foolishness, nay, an irrationality, unless perchance we wish to make infinite motion and infinite rest concur in one, as you verified to me yesterday concerning particular worlds.

PHIL. This I will not say concerning the universe, to which, by no reason, ought motion to be attributed; for this neither can nor ought to befit, nor be required of, the infinite; and never, as is said, was there found one who imagined it. But this philosopher, like one who had scarcity of ground, builds such castles in the air.

ELP. Certainly, I would desire an argument that should impugn what you say; for the five other reasons that this philosopher brings all make the same journey and go with the same feet. Therefore it seems to me a superfluous thing to bring them. Now, after he had produced these, which turn upon mundane and circular motion, he proceeds to propose those founded upon rectilinear motion; and he says likewise that “it is impossible that anything be movable with infinite motion toward the middle, or downward, or upward from the middle”; and he proves it, first, from the side of the proper motions of such bodies, both as to the extreme bodies and as to the intermediate. “Motion upward,” says he, “and motion downward are contrary; and the place of the one motion is contrary to the place of the other motion. Of

contraries, moreover, if the one is determined, the other must be determined; and the intermediate, which partakes of the one and the other determinate, must itself be such; for not from any place whatsoever, but from a certain part, must that depart which is to pass beyond the middle, because there is a certain term whence they begin, and another term where the limits of the middle end. The middle, then, being determined, the extremes must be determined; and if the extremes are determined, the middle must be determined; and if the places are determined, the bodies placed [in them] must be such also; for otherwise the motion will be infinite. Besides, as to gravity and levity, the body that goes upward can come to be in such a place: for no natural inclination is in vain. Therefore, the space of the world not being infinite, there is neither place nor body infinite. As to weight also, there is no infinite heavy or light; therefore there is no infinite body: as it is necessary that, if the heavy body is infinite, its gravity be infinite. And this cannot be escaped; for, if you would say that the infinite body has infinite gravity, three inconveniences would follow. First, that the gravity or levity of a finite and of an infinite body would be the same; for to the finite heavy body, by as much as it is surpassed by the infinite, I shall make addition and subtraction of so much and so much more, until it can attain to that same quantity of gravity and levity. Second, that the gravity of the finite magnitude could be greater than that of the infinite; for by that reason whereby it can be equal to it, it can also be superior to it, by adding as much as you please more of heavy body, or subtracting of this, or adding of light body. Third, that the gravity of the finite and of the infinite magnitude would be equal; and because that proportion which gravity has to gravity, the same has velocity to velocity, it would follow likewise that the same velocity and slowness could be found in a finite and in an infinite body. Fourth, that the velocity of the finite body could be greater than that of the infinite. Fifth, that it could be equal; or else, as the heavy exceeds the heavy, so velocity exceeds velocity: an infinite gravity being found, it will be necessary that it move through some space in less time than the finite gravity; or else that it move not at all, because velocity and slowness follow the magnitude of the body. Whence, there being no proportion between the finite and the infinite, it will be needful at last that the infinite heavy move not; for, if it move, it does not move so swiftly that there be not found a finite gravity which in the same

time, through the same space, makes the same progress.”

PHIL. It is impossible to find another who, under the title of philosopher, should feign more vain suppositions, and fabricate for himself such foolish contrary positions, so as to give place to as much levity as is seen in the reasons of this man. Now, so far as concerns what he says of the proper places of bodies, and of the determinate up, down, and middle, I would wish to know against what position this man argues. For all those who posit infinite body and magnitude posit neither middle nor extreme in it. For whoever speaks of the inane, the void, the infinite ether, attributes to it neither gravity, nor levity, nor motion, nor superior, nor inferior, nor middle region; and then, placing in such space those infinite bodies — such as is this earth, that and that other earth, this sun, that and that other sun — they all make their circuits within this infinite space through finite and determinate spaces, or else about their own centres. So we who are on the earth say the earth is in the middle, and all philosophers modern and ancient, of whatsoever sect, will say it is in the middle, without prejudice to their principles: as we say, with respect to the greater horizon of this ethereal region that lies about us, bounded by that equidistant circle, with respect to which we are as at the centre. Even so, no less, those who are in the moon understand that they have about them this earth, the sun, and other and other stars, which are about the middle and the term of the proper semidiameters of their own horizon: so the earth is no more centre than any other mundane body; and there are no more certain determinate poles to the earth, than the earth is a certain determinate pole to some other point of the ether and mundane space; and likewise of all the other bodies, which same bodies, by diverse respects, are all both centres, and points of circumference, and poles, and zeniths, and other differences. The earth, then, is not absolutely in the middle of the universe, but with respect to this our region. He proceeds, then, this disputant, with petition of principle, and presupposition of that which he ought to prove. He takes, I say, for principle the equivalent of the opposite of the contrary position; presupposing middle and extreme against those who, saying the world infinite, at the same time necessarily deny this extreme and middle, and consequently motion to a high and supreme place, and to a low and lowest. The ancients saw, then, and we too see, that something comes to the earth where we are, and something seems

to depart from the earth, or from the place where we are. Where, if we say and would say that the motion of such things is upward and downward, it is understood in a certain region, in certain respects; so that, if something, departing from us, proceeds toward the moon, as we say that it ascends, those who are in the moon, our antipodeans, will say that it descends. Those motions, then, that are in the universe have no difference of up, down, here, or there, with respect to the infinite universe, but [only] with respect to the finite worlds that are in it, taken either according to the amplitudes of innumerable mundane horizons, or according to the number of innumerable stars; where, again, the same thing, according to the same motion, with respect to diverse [observers], is said to go from on high and from below. Determinate bodies, then, have not infinite motion, but finite and determinate about their own terms. But of the indeterminate and infinite there is neither finite nor infinite motion, and there is no difference of place nor of time.

As to the argument he makes from gravity and levity, we say that this is one of the fairest fruits that the tree of stolid ignorance could produce. For gravity, as we shall demonstrate in the place of this consideration, is not found in any whole body naturally disposed and placed; and therefore they are not differences that ought to distinguish the nature of places and the reason of motion. Besides, we shall show that heavy and light come to be called the same thing according to the same impulse and motion with respect to diverse middles; as also, with respect to diverse [observers], the same thing is said to be high and low, to move up and down. And this I say as to particular bodies and particular worlds, of which none is heavy or light: and in which the parts, departing and diffusing themselves from them, are called light; and returning to the same, are called heavy: as the particles of the earth, or of terrestrial things, toward the circumference of the ether are said to rise, and toward their whole are said to descend. But as to the universe and the infinite body, who was ever found that called it heavy or light? or who posited such principles, and so raved, that one could consequently infer from his saying that the infinite is heavy or light, should ascend, mount, or soar? We shall show how, of the infinite bodies that are, none is heavy nor light. For these qualities befall the parts inasmuch as they tend to their whole and the place of their conservation, and therefore have no respect to the universe, but to their own

containing and whole worlds; as in the earth, when the parts of fire wish to free themselves and soar toward the sun, they ever lead with them some portion of the dry and the water to which they are joined; which, being multiplied above or on high, so by proper and most natural impulse return to their place. And further, and consequently confirmed: that the great bodies should be heavy or light is not possible, the universe being infinite; and therefore they have no reason of remoteness or nearness from or to circumference or centre; hence the earth is no heavier in its place than the sun in its, Saturn in its, the north star in its. We may, however, say that, as there are the parts of the earth that return to the earth by their gravity — for so we wish to call the impulse of the parts to the whole, and of the pilgrim to its proper place — so there are the parts of the other bodies, as there can be infinite other earths or [bodies] of like condition, infinite other suns or fires or [bodies] of like nature. All move from the circumferential places to their proper container, as to their middle: whence it would follow that there are infinite heavy bodies according to number. Yet there will not come to be an infinite gravity, as in one subject and intensively, but as in innumerable subjects and extensively. And this is what follows from the saying of all the ancients, and ours; and against this the disputant had no argument. That, then, which he says of the impossibility of the infinite heavy, is so true and open that it is a shame to make mention of it; and in no way does it appertain to destroying another's philosophy and confirming his own; but they are all matters and words cast to the wind.

ELP. The vanity of this man in the aforesaid reasons is more than manifest, so that all the art of persuasion would not suffice to excuse it. Now hear the reasons he adds, to conclude universally that there is no infinite body. "Now," says he, "it being manifest to those who regard particular things that there is no infinite body, it remains to see in the general whether this be possible. For someone might say that, as the world is thus disposed about us, so it is not impossible that there be other and more heavens. But, before we come to this, let us reason generally of the infinite. It is necessary, then, that every body be either infinite or finite; and this either is all of similar parts, or of dissimilar parts; and these either consist of finite species, or of infinite species. It is not possible that it consist of infinite species, if we will presuppose what we have

said — namely, that there are more worlds like this; for, as this world is disposed about us, so it is disposed about others, and there are other heavens. For, if the first motions, which are about the middle, are determined, the second motions must be determined; and therefore, as we already distinguished five sorts of bodies — of which two are simply heavy or light, and two moderately heavy or light, and one neither heavy nor light, but agile about the centre — so it must be in the other worlds. It is not possible, then, that it consist of infinite species. Nor is it possible that it consist of finite species.” And first he proves that it does not consist of finite dissimilar species, by four reasons; of which the first is that “each of these infinite parts will be water or fire, and consequently a thing heavy or light. And this has been shown impossible, when it was seen that there is neither infinite gravity nor infinite levity.”

PHIL. We have said enough, when we answered to that.

Elp. I know it. He adds the second reason, saying that “it is necessary that each of these species be infinite, and consequently the place of each must be infinite: whence it will follow that the motion of each is infinite; which is impossible. For it cannot be that a body which goes down should run downward to infinity; which is manifest from what is found in all motions and transmutations. As in generation one does not seek to make what cannot be made, so in local motion one does not seek the place whither one can never arrive; and that which it is impossible should be in Egypt, it is impossible should move toward Egypt; for nature does nothing in vain. It is impossible, then, that a thing move toward there whither it cannot arrive.”

PHIL. To this enough has been answered; and we say that there are infinite earths, infinite suns, infinite ether; or, according to the saying of Democritus and Epicurus, infinite plenum and void, the one implanted in the other. And there are diverse finite species, the ones comprehended by the others, and the ones ordered to the others. Which diverse species all stand as concurring to make one entire infinite universe, and likewise as infinite parts of the infinite, inasmuch as from infinite earths like this there proceeds in act an infinite earth — not as one single continuum, but as a [whole] comprehended of the innumerable multitude of them. Likewise is understood of the other species of

bodies, be they four, or two, or three, or however many you will (I do not determine at present); which, being parts (in such manner as they can be called parts) of the infinite, must be infinite, according to the mass that results from such multitude. Now here it is not needful that the heavy go to infinity downward. But as this heavy goes to its near and connatural body, so that to its, that other to its. This earth has the parts that appertain to it; that earth has its parts appertaining to itself. So that sun has its parts that diffuse from it and seek to return to it; and other bodies likewise naturally re-gather their parts. Whence, as the margins and distances of some bodies to other bodies are finite, so the motions are finite; and as no one departs from Greece to go to infinity, but to go to Italy or to Egypt, so, when a part of earth or of sun moves, it does not propose to itself the infinite, but a finite [thing] and a term. Yet, the universe being infinite and its bodies all transmutable, all consequently ever diffuse from themselves and ever gather into themselves, send forth of their own and receive within of the pilgrim. I do not reckon it an absurd and unfitting thing — nay, most fitting and natural — that there be finite transmutations possible to befall a subject; and therefore that particles of the earth should wander the ethereal region and meet, through the immense space, now one body and now another, no less than we see the same particles change place, disposition, and form, even while they are still here with us. Whence this earth, if it is eternal and perpetual, is not such by the consistency of its same parts and its same individuals, but by the vicissitude of others which it diffuses, and others which succeed in the place of those; in such wise that, of the same soul and intelligence, the body ever goes changing and renewing itself part by part. As appears also in animals, which are not continued otherwise than by the nutriments they receive, and the excrements they ever send forth; whence whoever considers well will know that, as young men, we have not the same flesh we had as children, and, as old men, not the same we had when we were young; for we are in continual transmutation, which brings with it that new atoms continually flow into us, and those once before received depart from us. As, concerning the seed, atoms being joined to atoms by the virtue of the general intellect and soul (by means of the frame in which, as matter, they concur), the body comes to be formed and to grow, when the influx of atoms is greater than the efflux; and then the same body is in a certain consistency

when the efflux is equal to the influx; and at last it goes into decline, the efflux being greater than the influx. I do not say the efflux and influx absolutely, but the efflux of the fitting and native, and the influx of the pilgrim and unfitting; which cannot be overcome by the weakened principle, by reason of the efflux, which is yet continual, of the vital as of the non-vital. To come, then, to the point, I say that, by such vicissitude, it is not unfitting, but most reasonable, to say that the parts and atoms have an infinite course and motion through the infinite vicissitudes and transmutations, both of forms and of places. It would be unfitting if, as a proximate prescribed term of local transmutation, or of alteration, there were found a thing that tended to infinity. Which cannot be, seeing that no sooner is a thing moved from one [place] than it is found in another place, is stripped of one [disposition] but it is invested with another disposition, and has left one [being] but has taken another being; which necessarily follows from the alteration, which necessarily follows from the local change. So that the proximate and formed subject cannot move save finitely, because it easily receives another form if it changes place. The first and formable subject moves infinitely, both according to space and according to the number of the figurations; while the parts of matter intrude and extrude themselves from this into that and into that other place, part and whole.

Elp. I understand very well. He adds, for a third reason, that “if one should say the infinite [to be] discrete and disjoined — whence there must be infinite individual and particular fires, and each of them then be finite — none the less it will come about that that fire which results from all the individuals must be infinite.”

PHIL. This I have already conceded; and to know this, he ought not to have forced himself against that from which no inconvenience follows. For, if a body be disjoined or divided into parts locally distinct, of which one weighs a hundred, another a thousand, another ten, it will follow that the whole weighs a thousand one hundred and ten. But this will be according to several discrete weights, and not according to one continuous weight. Now we and the ancients do not hold it an inconvenience that in discrete parts an infinite weight be found; for from those there results a weight logically, or arithmetically or geometrically, that truly and naturally does not make one weight, as they do not make one infinite mass, but make infinite finite masses

and weights. Which to say, to imagine, and to be, is not the same, but very diverse. For from this it does not follow that there is one infinite body of one species, but one species of body in infinite finite [bodies]; nor is there therefore one infinite weight, but infinite finite weights, seeing that this infinitude is not as of a continuum, but as of discretes; which are in one infinite continuum, that is, the space, the place, and dimension capable of them all. It is not, then, an inconvenience that there be infinite discrete heavy [bodies], which do not make one heavy; as infinite waters which do not make one infinite water, infinite parts of earth that do not make one infinite earth: so that there are infinite bodies in multitude, which physically do not compose one infinite body of magnitude. And this makes a very great difference; as is seen, proportionally, in the towing of a ship, which is drawn by ten united, and will never be drawn by thousands upon thousands disunited and each by itself.

ELP. With this and other discourse you have a thousand times resolved what he posits for the fourth reason; which says that “if an infinite body be understood, it is necessary that it be understood infinite according to all its dimensions; whence from no part can there be anything outside it: therefore it is not possible that in an infinite body there be several dissimilar [parts], of which each is infinite.”

PHIL. All this is true, and does not contradict us, who have so many times said that there are several finite dissimilars in one infinite, and have considered how this is. Perhaps proportionally, as if one should say there are several continuums together, as, for example and similitude, in a liquid mud, where always and in every part the water is continued to the water, and the earth to the earth; where, by reason of the insensibility of the concourse of the least parts of earth and the least parts of water, they will not be called discrete, nor several continuums, but one continuum, which is neither water nor earth, but mud. Where, indifferently, it may please another to say that, properly, the water is not continued to the water, and the earth to the earth, but the water to the earth, and the earth to the water; and there may likewise come a third who, denying both the one and the other manner of speaking, says that the mud is continued to the mud. And according to these reasons the infinite universe may be taken as one continuum, in which the ether interposed between such

great bodies makes no more discreteness than that air which is set between the parts of the water and of the dry [land] can make in the mud — the difference being only by reason of the smallness of the parts, and the minority and insensibility that is in the mud, and the greatness, majority, and sensibility of the parts that are in the universe: so that the contrary and the diverse movables concur in the constitution of one immovable continuum, in which the contraries concur to the constitution of one, and appertain to one order, and finally are one. An inconvenient and impossible thing, certainly, it would be to posit two infinities distinct from one another; seeing there would be no way to imagine how, where the one ends, the other begins, whence both should come to have a term, the one by the other. And it is, besides, most difficult to find two bodies finite in one extreme and infinite in the other.

ELP. He posits two other reasons, to prove that there is not an infinite of similar parts. “The first is, because it would be needful that to it should befit one of these species of local motion; and therefore there would be either an infinite gravity or levity, or an infinite circulation; all which — how impossible it is — we have demonstrated.”

PHIL. And we likewise have made clear how vain these discourses and reasons are; and that the infinite in the whole does not move, and is neither heavy nor light, both it and every other body in its natural place: nor even the separated parts, when they shall be removed beyond certain degrees from their proper place. The infinite body, then, according to us, is not movable, neither in potency nor in act; and is not heavy nor light, in potency nor in act: so far is it from being able to have infinite gravity or levity, according to our principles, and those of others against whom this man builds such fair castles.

ELP. The second reason for this is likewise vain; for vainly he asks “whether the infinite moves naturally or violently” — of one who never said that it moves, either in potency or in act. Next he proves that there is no infinite body by reasons drawn from motion in general, after he has proceeded by reason drawn from motion in common. He says, then, that the infinite body cannot have action upon a finite body, nor yet suffer from it; and he brings three propositions.

First, that “the infinite does not suffer from the finite”; because every motion, and consequently every passion, is in time; and if it is so, it could come about that a body of less magnitude could have a passion proportional to that; therefore, as there is a proportion of the finite patient to the finite agent, there would come to be the like of the finite patient to the infinite agent. This is seen, if we posit for the infinite body A, for the finite body B; and because every motion is in time, let the time be G, in which time A either moves or is moved. Let us take next a body of less magnitude, which is B; and let the line D be the agent acting upon another body (which body let be H) completely, in the same time G. From this it will truly be seen that there will be a proportion of D, the lesser agent, to B, the greater agent, as there is a proportion of the finite patient H to the finite part of A, which part let be AZ. Now, when we shall change the proportion of the first agent to the third patient, as is the proportion of the second agent to the fourth patient — that is, there will be a proportion of D to H, as is the proportion of B to AZ — B truly, in the same time G, will be a complete agent upon a finite thing and upon an infinite thing, that is, upon AZ, a part of the infinite, and upon A, the infinite. This is impossible; therefore the infinite body can be neither agent nor patient: because two equal patients suffer equally, in the same time, from the same agent; and the lesser patient suffers from the same agent in a lesser time, the greater patient in a greater time. Besides, when there are diverse agents [acting] in equal time, and their action is completed, there will come to be a proportion of agent to agent as is the proportion of patient to patient. Besides, every agent operates upon a patient in finite time (I speak of that agent which comes to the end of its action, not of that whose motion is continuous, as can be only the motion of translation), for it is impossible that a finite action be in infinite time. Behold, then, made manifest first, how the finite cannot have complete action upon the infinite.

[Figure.] G, the time. A, the infinite patient; B, the finite agent (the greater). AZ, a part of the infinite. H, the finite patient; D, the finite agent (the lesser). Second, it is shown likewise that “the infinite cannot be agent upon a finite thing.” Let the infinite agent be A, and the finite patient B; and let us posit that A, infinite, is agent upon B, finite, in time G. Next let the finite body D be agent upon the part of B, that is, BZ, in the same time G. Certainly there

will be a proportion of the patient BZ to the whole patient B, as is the proportion of D, the agent, to the other finite agent H; and the proportion being changed — of D, the agent, to BZ, the patient, as the proportion of H, the agent, to the whole B — consequently B will be moved by H in the same time in which BZ is moved by D, that is, in time G, in which time B is moved by the infinite agent A; which is impossible. Which impossibility follows from what we have said: namely, that, if an infinite thing operates in finite time, it is necessary that the action be not in time, because between the finite and the infinite there is no proportion. Therefore, positing two diverse agents that have the same action upon the same patient, necessarily the action of that [agent] will be in two diverse times, and there will be a proportion of time to time as of agent to agent. But, if we posit two agents, of which the one is infinite, the other finite, to have the same action upon one same patient, it will be necessary to say one of two [things]: either that the action of the infinite be in one instant, or else that the action of the finite agent be in infinite time. The one and the other is impossible. [Figure.] G, the time. A, the infinite agent; H, the finite agent. B, the finite patient; D, the finite agent. BZ, a part of the finite patient.

Third, it is made manifest how “the infinite body cannot operate upon an infinite body.” For, as has been said in the Physical Lecture, it is impossible that action or passion be without completion. It being demonstrated, then, that the action of the infinite upon an infinite can never be completed, it may be concluded that between them there can be no action. Let us posit, then, two infinities, of which let one be B, which is patient from A in finite time G — because the finite action is necessarily in finite time. Let us posit next that the part of the patient, BD, suffers from A; certainly it will be manifest that the passion of this comes to be in less time than the time G; and let this part be signified by Z. There will be, then, a proportion of the time Z to the time G, as is the proportion of BD, a part of the infinite patient, to the greater part of the infinite, that is, to B; and let this part be signified by BDH, which is patient from A in the time G; and in the same time the whole infinite B has already been patient from it: which is false, because it is impossible that there be two patients, of which one is infinite and the other finite, that suffer from the same agent, by the same action, in the same time — be the efficient finite, or, as we

have posited, infinite.

[Figure.] G, the finite time; Z, the lesser time. A, the infinite agent. B, the infinite patient, with its parts D and H.

PHIL. All that Aristotle says, I would have to be well said when it shall be well applied and when it shall conclude to the purpose; but, as we have said, there is no philosopher who has spoken of the infinite from whose manner of positing such inconveniences can follow. Nevertheless, not to answer what he says — because it is not contrary to us — but only to contemplate the import of his opinions, let us examine his manner of reasoning. First, then, in his supposing, he proceeds by non-natural foundations, wishing to take this and that part of the infinite; whereas the infinite cannot have part — unless indeed we wish to say that that part is infinite, since it implies a contradiction that in the infinite there be a greater part and a lesser part, and a part that has a greater and a lesser proportion to it; since you approach the infinite no more by the hundred than by the three, for the infinite number consists of no fewer infinite threes than of infinite hundreds. The infinite dimension is no less of infinite feet than of infinite miles: therefore, when we wish to speak of the parts of the infinite dimension, we do not say a hundred miles, a thousand leagues; for these can no less be called parts of the finite, and truly they are parts only of the finite, to whose whole they have proportion, and cannot be, nor ought to be esteemed, parts of that to which they have no proportion. So a thousand years are not part of eternity, because they have no proportion to the whole; but they are indeed parts of some measure of time, as of ten thousand years, of a hundred thousand centuries.

ELP. Now, then, make me understand: which will you say are the parts of the infinite duration?

PHIL. The proportional parts of the duration, which have proportion in the duration and time, but not in the infinite duration and infinite time; because in that, the greatest time — that is, the very greatest proportional part of the duration — comes to be equivalent to the least, seeing that the infinite centuries are no more than the infinite hours: I say that in the infinite duration, which is eternity, the hours are no more than the centuries; so that everything that is called part of the infinite, inasmuch as it is part of the

infinite, is infinite, both in the infinite duration and in the infinite mass. From this doctrine you may consider how circumspect Aristotle is in his suppositions, when he takes the finite parts of the infinite; and how great is the force of the reasons of certain theologians, when from the eternity of time they wish to infer the inconvenience of so many infinities greater the one than the other, as there can be species of numbers. From this doctrine, I say, you have the means to extricate yourselves from innumerable labyrinths.

ELP. Particularly from that which makes to our purpose, of the infinite paces and infinite miles, which would come to make one lesser infinite and another greater infinite in the immensity of the universe. Now proceed.

PHIL. Second, in his inferring, Aristotle does not proceed demonstratively. For from this — that the universe is infinite, and that in it (I do not say of it, for it is one thing to say parts in the infinite, another of the infinite) there are infinite parts, which all have action and passion, and consequently transmutation among themselves — he wishes to infer either that the infinite has action or passion upon the finite or from the finite, or else that the infinite has action upon the infinite, and this suffers and is transmuted by that. This illation we say does not hold physically, though logically it be true: seeing that, however much — computing with reason — we find infinite parts that are active, and infinite that are passive, and these be taken as one contrary and those as another contrary; in nature, then — these parts being disjoined and separate, and divided by particular terms, as we see — they do not force nor incline us to say that the infinite is agent or patient, but that in the infinite innumerable finite parts have action and passion. It is conceded, then, not that the infinite is movable and alterable, but that in it there are infinite movables and alterables; not that the finite suffers from the infinite, according to physical and natural infinitude, but according to that which proceeds from a logical and rational aggregation, which computes all heavy [bodies] into one heavy, although all heavy [bodies] are not one heavy. The infinite standing, then, and the whole, immovable, inalterable, incorruptible, in it there can be, and there are, innumerable and infinite motions and alterations, perfect and complete. Add to what has been said that, granting there be two bodies infinite on one side, which on the other side come to terminate one another, there will not follow from this what Aristotle thinks necessarily follows —

namely, that the action and passion would be infinite; seeing that, if of these two bodies the one is agent upon the other, it will not be agent according to its whole dimension and magnitude, because it is not near, proximate, joined, and continued to the other according to that whole, and according to all the parts of that. For let us put the case that there are two infinite bodies A and B, which are continued or joined together in the line or surface FG. Certainly they will not come to operate the one against the other according to their whole virtue; because they are not proximate the one to the other according to all the parts, seeing that the continuation cannot be save in some finite term. And I say further that, though we suppose that surface or line to be infinite, it will not follow from this that the bodies, continued in it, cause infinite action and passion; because they are not intense, but extense, as the parts are extense. Whence it comes about that in no part does the infinite operate according to its whole virtue, but extensively, according to part and part, discretely and separately. As, for example, the parts of two contrary bodies that can be altered are the neighbouring ones, as A and 1, B and 2, C and 3, D and 4; and so running on to infinity. Where you can never verify an action intensively infinite, because of those two bodies the parts cannot be altered beyond a certain and determinate distance; and therefore M and 10, N and 20, O and 30, P and 40 have no aptitude to be altered. Behold, then, how, two infinite bodies being posited, there would not follow an infinite action. I say further that, although it be supposed and conceded that these two infinite bodies could have action one against the other intensively, and refer themselves one to the other according to their whole virtue, there would not therefore follow the effect of any action or passion; because the one is no less valiant in repugning and resisting than the other can be in impugning and insisting, and therefore no alteration would follow. Behold, then, how, from two infinities set against each other, either a finite alteration follows, or none at all.

ELP. Now what will you say to the supposition of the one contrary body finite and the other infinite — as if the earth were a cold body, and the heaven were fire, and all the stars fires, and the heaven immense, and the stars innumerable? Will you have it that from this should follow what Aristotle induces — that the finite would be absorbed by the infinite?

PHIL. Certainly not, as may be gathered from what we have said. For, the corporeal virtue being extended through the dimension of an infinite body, it would not come to be efficient against the finite with infinite vigour and virtue, but with that which it can diffuse from the finite parts, removed according to a certain distance; seeing that it is impossible that it operate according to all its parts, but according to the proximate ones only. As is seen in the preceding demonstration: where we presuppose A and B two infinite bodies; which are not apt to transmute one another, save by the parts that are within the distance between 10, 20, 30, 40, and M, N, O, P; and therefore it matters nothing, toward making a greater and more vigorous action, though the body B run and grow to infinity, and the body A remain finite. Behold, then, how from two contraries set against each other there ever follows a finite action and a finite alteration: no less supposing both of them infinite, the one and the other, than supposing the one infinite and the other finite.

ELP. You have much satisfied me, so that it seems to me a superfluous thing to bring those other little wild reasons with which he would demonstrate that outside the heaven there is no infinite body — such as that which says: “every body that is in a place is sensible; but outside the heaven there is no sensible body; therefore there is no place.” Or else thus: “every sensible body is in a place; outside the heaven there is no place; therefore there is no body. Nay, neither is there an ‘outside,’ for ‘outside’ signifies a difference of place and of sensible place — and not a spiritual and intelligible body, as someone might say: if it is sensible, it is finite.”

Phil. I believe and understand that ever and ever beyond that imagined margin of the heaven there is an ethereal region, and mundane bodies, stars, earths, suns; and all sensible absolutely in themselves, and to those who are in them or near them, although they be not sensible to us by reason of their remoteness and distance. And in the meanwhile consider what foundation this man takes — that, from this, that we have no sensible body beyond the imagined circumference, he wishes that there be no body at all: and therefore he stopped at believing no other body than the eighth sphere, beyond which the astrologers of his time had not comprehended any other heaven. And because they ever referred the apparent whirling of the world about the earth to a first movable above all the others, they laid such foundations that they have gone

on without end ever joining sphere to sphere, and have found the others without stars, and consequently without sensible bodies. Inasmuch as the astrological suppositions and fancies condemn this opinion, it comes to be much more condemned by those who better understand how the bodies said to belong to the eighth heaven have no less distinction among themselves of greater and lesser distance from the surface of the earth than the other seven; for the reason of their equidistance depends only upon the most false supposition of the fixity of the earth; against which all nature cries out, and every reason proclaims, and every regulated and well-informed intellect at last gives sentence. Yet, be it as it will, it is said, against all reason, that there the universe ends and terminates where the reach of our sense concludes; for sensibility is a cause to make us infer that the bodies are, but the negation of it — which can be by defect of the sensitive power, and not of the sensible object — is not sufficient even for a light suspicion that the bodies are not. For, if truth depended on such sensibility, the bodies that appear so near and adherent the one to the other would be such [in fact]. But we judge that such a star appears smaller in the firmament, and is said to be of the fourth and fifth magnitude, which will be much greater than that which is said to be of the second and first; in the judgment of which the sense deceives [us], being not able to know the reason of the greater distance; and we, from this, that we have known the motion of the earth, know that those worlds have not such equidistance from this, and that they are not as in one deferent.

ELP. You mean that they are not as plastered into one same cupola: a thing unworthy that even children should be able to imagine it — who perhaps would believe that, if they were not attached to the celestial tribune and plate with good glue, or nailed with most tenacious nails, they would fall upon us not otherwise than the hailstones of the neighbouring air. You mean that those so many other earths and so many other most spacious bodies hold their regions and their distances in the ethereal field, not otherwise than this earth, which by its revolution makes it appear that all together, as if concatenated, turn about it. You mean that we must not admit a spiritual body outside the eighth or ninth sphere, but that this same air — as it is about the earth, the moon, the sun, the container of them — so goes amplifying itself to infinity, to the containing of other infinite stars and great animals; and this air comes to

be the common and universal place; and holds an infinite spacious bosom, no otherwise container in the whole infinite universe than in this space sensible to us by so many and so numerous lamps. You mean that it is not the air, and this containing body, that moves circularly, or that snatches the stars along — as [it is not] the earth and the moon and others — but that those move by their own soul through their spaces, having all those proper motions which are beyond that mundane one (which appears by the motion of the earth), and beyond others which appear common to all the stars, as if attached to one movable body; which all have appearance by reason of the diverse differences of motion of this star in which we are, and whose motion is insensible to us. You mean, consequently, that the air, and the parts that are taken in the ethereal region, have no motion save of restriction and amplification, which must be by reason of the progress of these solid bodies through it, while the ones wheel about the others, and while it behoves that this spiritual body fill the whole.

PHIL. True. Besides, I say that this infinite and immense is one animal, although it have not a determinate figure and sense referred to exterior things: for it has all the soul in itself, and comprehends all the animate, and is the whole of it. Besides, I say that there follows no inconvenience, as of two infinities; for, the world being an animated body, in it there is infinite motive virtue and infinite subject of mobility, in the manner we have said, discretely: for the whole continuum is immovable, both as to circular motion, which is about the middle, and as to rectilinear motion, which is from the middle or to the middle; since it has neither middle nor extreme. We say, besides, that motion of heavy and light not only is unbecoming to the infinite body, but neither to a whole and perfect body that is in it, nor to a part of any of these which is in its place and enjoys its natural disposition. And I return to say that nothing is heavy or light absolutely, but relatively: I say, with respect to the place, toward which the diffused and dispersed parts retire and gather. And let this suffice to have considered today, as to the infinite mass of the universe; and tomorrow I will await you for what you wish to understand as to the infinite worlds that are in it.

Elp. I, although by this doctrine I believe myself made capable of that other, yet, for the hope of hearing other particular and worthy things, will return.

FRAC. And I will come to be a hearer only.

BURCH. And I; for, as little by little I go more and more drawing near to understanding you, so by hand by hand I come to esteem as probable, and perhaps true, what you say.

The Third Dialogue

Interlocutors: Filoteo, Elpino, Fracastorio, Burchio.

PHIL. One, then, is the heaven, the immense space, the bosom, the universal container, the ethereal region through which the whole courses and moves. There innumerable stars, constellations, globes, suns, and earths are sensibly seen, and infinite are reasonably argued to be. The immense and infinite universe is the composite that results from such space and so many comprised bodies.

ELP. So that there are no spheres of concave and convex surface, no deferent orbs; but all is one field, all is one general receptacle.

PHIL. So it is.

ELP. That, then, which made men imagine diverse heavens has been the diverse astral motions: with this, that one saw a heaven full of stars wheeling about the earth, without that any of those lights was in any way seen to depart from another, but, ever keeping the same distance and relation, together with a certain order, they turned about the earth not otherwise than a wheel, in which innumerable mirrors are nailed, turns about its own axis. Whence it is esteemed most evident, as to the sense of the eyes, that to those luminous bodies no proper motion befits — as though they could course, like birds, through the air — but [that they move] by the revolution of the orbs in which they are fixed, made by the divine pulse of some intelligence.

PHIL. So it is commonly believed; but this imagination — once the motion shall be understood of this mundane star in which we are, which, without being fixed to any orb, through the general and spacious field, agitated by the intrinsic principle, its proper soul and nature, courses about the sun and wheels about its own centre — will come to be taken away: and the door of the

understanding of the true principles of natural things will be opened, and with great strides we shall be able to course along the road of truth, which, hidden under the veil of so many sordid and bestial imaginations, has up to the present been concealed by the injury of time and the vicissitude of things, since to the day of the ancient sages there succeeded the dark night of rash sophists.

It does not stand, but rolls and turns,
all that in heaven and beneath the heaven is beheld.
Each thing runs on, now high, now low,
be it in long course or in short,
be it heavy or be it light;
and perhaps all goes at the selfsame pace
and to the selfsame point.
So much the whole runs on, until it is arrived.
So much the bubbling whirls the water topsy-turvy,
that one same part,
now from above downward, now from below upward, departs,
and the same turmoil
imparts to all the same lots.

ELP. Certainly there is no doubt that that fancy of the star-bearing and flamebearing [spheres], of the axes, of the deferents, of the service of the epicycles, and of many other chimeras, is caused by no other principle than the imagining — as it appears — that this earth is in the middle and centre of the universe, and that, it alone being immovable and fixed, the whole comes to wheel about it.

PHIL. This same appears to those who are in the moon and in the other stars that are in this same space, which are either earths or suns.

ELP. Supposing, then, for now, that the earth by its motion causes this appearance of the diurnal and mundane motion, and that by the diverse differences of such motion it causes all those [motions] that are seen to agree alike in innumerable stars, we shall remain to say that the moon (which is another earth) moves by itself through the air about the sun. Likewise Venus, Mercury, and the others, which are also other earths, make their courses about

the same father of life.

PHIL. So it is.

ELP. The proper motions of each are those which are seen, besides this motion called mundane, and proper to the so-called fixed [stars] (of which both the one and the other must be referred to the earth); and such motions are of as many differences as there are bodies: so that two stars will never be seen to agree in one and the same order and measure of motion, if motion shall be seen in all those which show no variation by reason of the great distance they have from us. Those [stars], although they make their circuits about the solar fire and turn about their own centres for the participation of the vital heat, the differences of their drawing near and going far off cannot be comprehended by us.

PHIL. So it is.

ELP. There are, then, innumerable suns; there are infinite earths, which likewise circle those suns, as we see these seven circle this sun near us.

PHIL. So it is.

ELP. How, then, is it that about other lights, which are the suns, we do not see other lights, which are the earths, course; but beyond these we cannot comprehend any motion, and all the other mundane bodies (except still those called comets) are seen ever in the same disposition and distance?

PHIL. The reason is, because we see the suns, which are the greatest, nay, the very greatest bodies; but we do not see the earths, which, being much smaller bodies, are invisible; as it is not against reason that there be still other earths that turn about this sun, and are not manifest to us — either by reason of greater remoteness, or of smaller quantity, or for not having much surface of water, or for not having that surface turned toward us and set against the sun, by which, like a crystalline mirror, conceiving the luminous rays, it would render itself visible. Whence it is no marvel, nor a thing against nature, that many times we hear the sun to be in some sort eclipsed, without the moon coming to interpose itself between it and our sight. Besides the visible, there can be also innumerable watery lights (that is, earths, of which the waters are a part) that circle the sun; but the difference of their circuit is insensible by

reason of the great distance; whence in that most slow motion, which is comprehended in those that are visible above or beyond Saturn, no difference is seen of the motion of the ones and the motion of the others, nor any rule in the motion of all about the middle — whether we set the earth for the middle, or whether the sun be set for the middle.

ELP. How, then, would you have it that all [these bodies], however most distant from the middle — that is, from the sun — could reasonably participate the vital heat from it?

PHIL. From this: that the farther off they are, the greater circle they make; the greater circle they make, the more slowly they move about the sun; the more slowly they move, the more they resist the hot and fiery rays of it.

ELP. You would have it, then, that those bodies, though they were so far from the sun, can yet participate so much heat as suffices; because, turning more swiftly about their own centre and more slowly about the sun, they can not only participate as much heat, but even more, if it were needful; seeing that, by the swifter motion about their own centre, the same part of the convex of the earth that was not so much heated returns the sooner to be restored; and, by the slower motion about the fiery middle, and standing firmer to its impression, comes to receive the more vigorous the flaming rays?

PHIL. So it is.

ELP. Then you would have it that, if the stars that are beyond Saturn, as they appear, are truly immovable, they will come to be the innumerable suns or fires, more and less sensible to us, about which course the neighbouring earths insensible to us?

PHIL. So it would have to be said, seeing that all the earths are worthy to have the same reason, and all the suns the same.

ELP. Would you have it, for this, that all those are suns?

PHIL. No; for I know not whether all, or the greater part, are immovable, or whether some of them turn about the others, because there is no one who has observed it, and besides it is not easy to observe: as not easily is seen the motion and progress of a distant thing, which over a great stretch is not easily seen changed of place, as happens in seeing ships set on the high sea. But, be it as it

will, the universe being infinite, it is needful at last that there be more suns; for it is impossible that the heat and light of one particular [sun] could diffuse itself through the immense, as Epicurus could imagine, if it be true what others report. Therefore it is required also that there be innumerable suns, of which many are visible to us in the likeness of a small body; but such a star will appear the lesser which will be much greater than that which seems to us the greatest.

ELP. All this must at least be judged possible and fitting.

PHIL. About those [suns] there can turn earths of greater and smaller mass than this.

ELP. How shall I know the difference? how, I say, shall I distinguish the fires from the earths?

PHIL. From this: that the fires are fixed and the earths movable; from this, that the fires twinkle and the earths do not; of which signs the second is more sensible than the first.

ELP. They say that the appearance of twinkling proceeds from the distance from us.

PHIL. If that were so, the sun would not twinkle more than all [others]; and the lesser stars, which are farther off, would twinkle more than the greater, which are nearer.

ELP. Would you have it that the igneous worlds are inhabited as well as the watery?

PHIL. No worse and no less.

ELP. But what animals can live in fire?

PHIL. You must not believe that those are bodies of similar parts, for then they would not be worlds, but empty, vain, and sterile masses. Therefore it is fitting and natural that they have diversity of parts, as this and other earths have diversity of their proper members; although these [parts] be sensible as illumined waters, and those as luminous flames.

ELP. Do you believe that, as to consistency and solidity, the proximate matter of the sun is the same as is the proximate matter of the earth? (For I know that

you do not doubt that the first matter of all is one.)

PHIL. So it is, certainly. The Timaeus understood it, Plato confirmed it, all true philosophers have known it, few have explained it, no one in our times has been found who has understood it; nay, many in a thousand ways go disturbing the understanding of it; which has come about by the corruption of habit and the defect of principles.

ELP. To this manner of understanding, if it has not attained, yet the Learned Ignorance of Cusanus seems to draw near, when, speaking of the conditions of the earth, he says this sentence: "You must not esteem that, from the darkness and black colour, we can argue that the terrestrial body is vile and more ignoble than the others; for, if we were inhabitants of the sun, we should not see that brightness which we see in it from this circumferential region toward it. Besides which, at present, if we fix the eye well upon it, we shall discover that it has toward its middle, as it were, an earth, or else like a humid and cloudy body that, as from a circumferential circle, diffuses the clear and radiant light. Whence no less than the earth does it come to be composed of its proper elements."

PHIL. Thus far he speaks divinely; but go on, bringing what he adds.

ELP. By what he adds, it may be given to understand that this earth is another sun, and that all the stars are likewise suns. He says thus: "If anyone were beyond the region of fire, this earth would come to appear a luminous star in the circumference of its region by means of the fire; not otherwise than to us, who are in the circumference of the region of the sun, the sun appears most luminous; and the moon does not likewise appear luminous, because perhaps about the circumference of it we are toward the more middle parts, or, as he says, central — that is, in the humid and watery region of it; and therefore, although it have its proper light, none the less it does not appear; and we see only that which on the watery surface is caused by the reflection of the solar light."

PHIL. He has known and seen much, this gentleman, and is truly one of the most singular wits that have breathed under this air; but, as to the apprehension of truth, he has done like a swimmer tossed by tempestuous waves, now high, now low; for he did not see the light continuous, open, and

clear, and did not swim as on a level and tranquil [water], but interruptedly and with certain intervals. The reason of this is that he had not evacuated all the false principles with which he was imbued from the common doctrine whence he had departed; so that, perhaps by design, the title given to his book is much to the purpose: Of the Learned Ignorance, or Of the Ignorant Doctrine.

ELP. Which is that principle which he has not evacuated, and ought to have evacuated?

PHIL. That the element of fire is, as it were, air made attrite by the motion of the heaven, and that fire is a most subtle body — against that reality and truth which is made manifest to us by what, to other purposes and in our proper discourses, we consider: where it is concluded to be necessary that there be a material, solid, and consistent principle as well of the hot as of the cold body; and that the ethereal region cannot be of fire, nor fire, but enkindled and set ablaze by the neighbouring solid and dense body, such as is the sun. So that, where we can speak naturally, there is no need to have recourse to mathematical fancies. We see the earth to have all its parts, which of themselves are not luminous; we see that some can shine by another, as its water, its vaporous air, which receive the heat and light of the sun and can transfuse the one and the other to the surrounding regions. Therefore it is necessary that there be a first body to which it befits at once to be of itself luminous and of itself hot; and such cannot be, if it be not constant, thick, and dense; for the rare and tenuous body cannot be the subject of light nor of heat, as is at other times demonstrated by us to its purpose. It is necessary, then, at last, that the two foundations of the two contrary first active qualities be likewise constant; and that the sun, according to those parts which in it are luminous and hot, be like a stone, or a most solid fiery metal — I will not say a liquefiable metal, such as lead, bronze, gold, silver, but such a metal as is unliquefiable; not iron that is made fiery, but such iron as is fire itself; and that, as this star in which we are is of itself cold and dark, no whit partaking of heat and light, save inasmuch as it is heated by the sun, so that [sun] is of itself hot and luminous, no whit partaking of coldness and opacity, save inasmuch as it is refreshed by the surrounding bodies and has in itself parts of water, as the earth has parts of fire. And therefore, as in this most cold body, the first

cold and opaque, there are animals that live by the heat and light of the sun, so in that most hot and shining [body] there are those that vegetate by the refrigeration of the surrounding cold [bodies]: and as this body is, by a certain participation, hot in its dissimilar parts, so that [body] is, according to a certain participation, cold in its.

ELP. Now what say you of light?

Phil. I say that the sun does not give light to the sun, the earth does not give light to the earth, no body gives light to itself; but every luminous [body] gives light in the space about it. Therefore, although the earth be a luminous body by the rays of the sun upon its crystalline surface, its light is not sensible to us, nor to those who find themselves on that surface, but to those who are opposite to it. As, besides, granted that the whole surface of the sea by night be illumined by the splendour of the moon, yet to those who go upon the sea it does not appear save in a certain space that is opposite, toward the moon; to whom, if it were given to raise themselves more and more toward the air, above the sea, ever more and more would the dimension of the light grow upon them, and they would see more space of luminous field. Hence most easily may be drawn how those that are in the luminous or illumined stars have not sensible the light of their own star, but that of the surrounding [stars]; as in the same common place a particular place takes light from a different particular place.

ELP. Then you mean to say that to the solar animals the sun makes not day, but another surrounding star?

PHIL. So it is. Do you not grasp it?

ELP. Who would not grasp it? Nay, by considering this I come to grasp many other things in consequence. There are, then, two sorts of luminous bodies: igneous, and these are luminous primarily; and watery or crystalline, and these are luminous secondarily.

PHIL. So it is.

ELP. Then the reason of light must not be referred to another principle?

PHIL. How can it be otherwise, no other foundation of light being known to us? Why would we lean upon vain fancies, where experience itself instructs us?

ELP. It is true that we must not think those bodies have light by a certain inconstant accident, like the rottenness of woods, the scales and viscous slime of fishes, or the most fragile back of glow-worms and night-shining flies, of the reason of whose light we shall at another time discourse.

PHIL. As it shall please you.

ELP. Thus, then, those who say that the surrounding luminous bodies are certain quintessences, certain divine corporeal substances of a nature contrary to these that are near us, and near which we are, deceive themselves no otherwise than those who should say the same of a candle, or of a shining crystal seen from afar.

PHIL. Certainly.

FRAC. In truth this is conformable to every sense, reason, and intellect.

BURCH. Not to mine, which easily judges this opinion of yours a sweet sophistry.

PHIL. Answer this man, you, Fracastorio; for I and Elpino, who have discoursed much, will stand to hear you.

FRAC. My sweet Burchio, I for my part set you in the place of Aristotle, and I will be in the place of an idiot and rustic who confesses to know nothing, presupposes that he has understood nothing — both of what Filoteo says and understands, and of what Aristotle and all the world besides understand. I believe the multitude; I believe the name of the fame and majesty of the Peripatetic authority; I admire, together with an innumerable multitude, the divinity of this daemon of nature; but for that very reason I come to you to be informed of the truth, and to free myself from the persuasion of this man whom you call a sophist. Now I ask you, for what cause do you say there is a very great — or great, or any whatsoever — difference between those celestial bodies and these that are near us?

BURCH. Those are divine, these are vile stuff.

FRAC. How will you make me see and believe that those are more divine?

BURCH. Because those are impassible, inalterable, incorruptible, and eternal, and these the contrary; those movable with circular and most perfect motion,

these with rectilinear.

Frac. I would wish to know whether, after you shall have well considered, you would swear that this single body (which you understand as three or four bodies, and do not grasp as members of the same composite) is not movable like the other movable stars — granted that the motion of those is not sensible because we are removed beyond a certain distance from them, and that this [Earth's motion], if it is, cannot be sensible to us, because, as the ancient and modern true contemplators of nature have noted, and as sense makes manifest in a thousand ways by experience, we cannot apprehend motion save by a certain comparison and relation to something fixed. For, take one who does not know that the water runs, and who does not see the banks, finding himself in the middle of the water within a running ship: he would have no sense of the motion of it. From this I might enter into doubt and be uncertain of this rest and fixity; and I may esteem that, if I were in the sun, in the moon, and in other stars, I should ever seem to be in the centre of the immovable world, about which all the surrounding [things] would come to turn — turning, however, as the containing body in which I find myself, about its own centre. Behold how I am not certain of the difference between movable and stable.

As to what you say of rectilinear motion: certainly we do not see this body move in a straight line, as neither do we see the others. The earth, if it moves, moves circularly, as the other stars [do], as Hegesias, Plato, and all the wise say, and as Aristotle and every other must concede. And of the earth, that which we see mount and descend is not the whole globe, but certain particles of it; which do not depart beyond that region which is reckoned among the parts and members of this globe: in which, as in an animal, there is the efflux and influx of parts, and a certain vicissitude, and a certain commutation and renovation. All which, if it likewise be in the other stars, it is not required that it be likewise sensible to us; for these elevations of vapours and exhalations, successions of winds, rains, snows, thunders, sterilities, fertilities, inundations, births, deaths — if they be in the other stars, cannot likewise be sensible to us. But only are those bodies sensible to us by the continual splendour that from the surface of fire, or of water, or of cloud, they send through the great space. As likewise this star is sensible to those who are in the others by the splendour that it diffuses from the face of the seas (and sometimes from the countenance

affected by cloudy bodies, by reason of which in the moon, by the same reason, the opaque parts appear less opaque) — which face is not changed save by a very great interval of ages and centuries, in the course of which the seas change into continents and the continents into seas. This [body], then, and those bodies, are sensible by the light they diffuse. The light that from this earth is diffused to the other stars is neither more nor less perpetual and inalterable than that of like stars: and, as the rectilinear motion and alteration of those particles is insensible to us, so to them is insensible every other motion and alteration that may be found in this body. And as, of the moon, from this earth (which is another moon), there appear diverse parts, some more, some less luminous, so, of the earth, from that moon (which is another earth), there appear diverse parts by the variety and difference of the spaces of its surface. And as, if the moon were farther off, the diameter of the opaque parts failing, the luminous parts would come to unite and contract into a sensibility of a smaller and wholly luminous body, so likewise would the earth appear, if it were farther from the moon. Whence we may esteem that, of innumerable stars, there are as many other moons, as many other terrestrial globes, as many other worlds like this; about which it seems that this earth turns, as those appear to wheel and turn about this earth. Why, then, would we affirm there to be a difference between this and those bodies, if we see every conformity? why would we deny there to be conformity, if there is neither reason nor sense that should induce us to doubt of it?

BURCH. So, then, you have for proved that those bodies do not differ from this?

FRAC. Well enough; for what of this can be seen from there can be seen of those from here; what of those can be seen from here, of this is seen from there — as if to say: a small body, this one and those; luminous in part from a lesser distance, this one and those; luminous in whole from a greater distance, and smaller, this one and those.

(continued) — Filoteo, Elpino, Fracastorio, Burchio.

BURCH. Where, then, is that fair order, that fair ladder of nature, by which one ascends from the denser and grosser body, such as the earth, to the less gross, such as water; to the subtle, such as vapour; to the more subtle, such as

the pure air; to the most subtle, such as fire; to the divine, such as the celestial body? from the dark to the less dark, to the clear, to the clearer, to the clearest? from the gloomy to the most lucid, from the alterable and corruptible to that free of all alteration and corruption? from the most heavy to the heavy, from this to the light, from the light to the most light, thence to that which is neither heavy nor light? from that movable to the middle, to that movable from the middle, thence to that movable about the middle?

FRAC. Would you know where this order is? Where dreams, fancies, chimeras, and madnesses are. For, as to motion, all that which naturally moves has a circular conveyance, either about its own or about another's middle; I say circular, not considering the circle and circulation simply and geometrically, but according to that rule whereby we see natural bodies physically change place. Rectilinear motion is neither proper nor natural to any principal body; for it is not seen save in the parts that are, as it were, excrements, which have efflux from the mundane bodies, or else, from elsewhere, have influx to the kindred spheres and containers. As we see of the waters, which, thinned by heat into the form of vapour, mount on high; and, thickened by cold into their proper form, return below; in the manner we shall tell in its proper place, when we shall consider of motion. As to the disposition of the four bodies, which they call earth, water, air, fire, I would wish to know what nature, what art, what sense makes it, verifies it, demonstrates it.

BURCH. Do you then deny the famous distinction of the elements?

Frac. I do not deny the distinction, for I leave everyone to distinguish in natural things as he pleases; but I deny this order, this disposition: namely, that the earth is surrounded and contained by water, the water by air, the air by fire, the fire by heaven. For I say that there is one container and comprehender of all the bodies and great machines that we see, as it were, disseminated and scattered in this most ample field: where each of such bodies, stars, worlds, eternal lights is composed of that which is called earth, water, air, fire. And in them, if in the substance of the composition the fire predominates, the body is denominated which is called sun, and luminous of itself; if water predominates in it, the body is denominated which is called earth, moon, or of like condition, which shines by another, as has been said. In these stars or

worlds, then, as we may call them, these dissimilar parts are understood to be ordered no otherwise — according to the various and diverse complexions of stones, tin, rivers, fountains, seas, sands, metals, caverns, mountains, plains, and other like species of composite bodies, of sites and figures — than are, in animals, the parts called heterogeneous, according to the diverse and various complexions of bones, intestines, veins, arteries, flesh, nerves, lungs, members of one and another figure; presenting their mountains, their valleys, their recesses, their waters, their spirits, their fires, with accidents proportional to all meteorological impressions; such as are catarrhs, erysipelas, stones, vertiges, fevers, and other innumerable dispositions and habits that answer to the mists, rains, snows, heats, and kindlings, to the lightnings, thunders, earthquakes, and winds, to the fervid and frozen tempests. If, then, the earth and the other [great bodies] are animals otherwise than these commonly esteemed [animals], they are certainly animals with greater and more excellent reason. Yet how shall Aristotle, or another, be able to prove that the air is more about the earth than within the earth, if there is no part of it in which the air has not place and penetration — according to the manner in which perhaps the ancients meant the void, to comprehend everything from without and to penetrate within the plenum? Where can you imagine the earth to have thickness, density, and consistency without the water that couples and unites the parts? How can you understand the earth toward the middle to be heavier, unless you believe that there its parts are thicker and denser — whose thickness is impossible without the water that alone is potent to glue part to part? Who does not see that everywhere out of the earth there come forth islands and mountains above the water; and not only above the water, but besides above the vaporous and tempestuous air, enclosed among the high mountains and reckoned among the members of the earth, to make a perfectly spherical body? whence it is open that the waters are no less within the bowels of it than the humours and blood within ours. Who does not know that in the deep caverns and concavities of the earth are the principal congregations of water? And if you say that it swells up over the shores, I answer that these are not the superior parts of the earth, for all that is within the highest mountains is understood [to be] in its concavity. Besides, the like is seen in dusted droplets, hanging and consistent upon a level surface: for the inmost soul, which comprehends and is

in all things, by the first [of its operations] makes this operation — that, according to the capacity of the subject, it unites the parts as much as it can. And it is not [the case] that the water is, or can naturally be, above or about the earth, more than the humid of our substance is above or about our body. I leave aside that the congregations of the waters in the middle are seen to be more eminent from all the shores and from all places where such congregations are found. And certainly, if the parts of the dry [land] could likewise unite of themselves, they would do the like — as they openly come to be enclosed into a sphere when, by the benefit of the water, they are glued together: for all the union and thickness of parts that is found in the [dry land] proceeds from the water. The waters being, then, within the bowels of the earth, and there being no part of it that has union of parts and thickness which does not comprehend more parts of water than of the dry — for where the thickest is, there above all is the composition and dominion of that subject which has the virtue of the cohering parts — who will there be that for this would not rather affirm that the water is the base of the earth, than the earth of the water? that upon this is founded that, not that upon this? I leave aside that the altitude of the water above the face of the earth which we inhabit, called the sea, cannot be and is not so great as to be worthy of comparison with the mass of this sphere; and it is not truly about it, as the senseless believe, but within it. As, forced by the truth, or else by the custom of speech of the ancient philosophers, Aristotle confessed in the first [book] of his *Meteorology*, when he confessed that the two lowest regions of the turbulent and restless air are intercepted and comprehended by the high mountains, and are as parts and members of [the earth]; which is surrounded and comprehended by an air ever tranquil, serene, and clear to the aspect of the stars; whence, lowering the eyes, one sees the whole multitude of winds, clouds, mists, and tempests, fluxes and refluxes, that proceed from the life and breathing of this great animal and deity which we call Earth — whom they named Ceres, figured as Isis, entitled Proserpina and Diana, who is the same that is called Lucina in heaven; understanding that this [Earth] is not of a nature different from that [heaven]. See how far it is [from the truth] that this good Homer — when he does not sleep — should say that water has its natural seat above or about the earth, where neither winds nor rains nor murky

impressions are found. And if he had considered and attended more, he would have seen that even in the middle of this body (if there be the centre of gravity) there is more place of water than of the dry: for the parts of the earth are not heavy unless much water come into composition with them; and without the water they have no aptitude, from the impulse and proper weight, to descend from the air to find the sphere of their proper container. What regulated sense, then, what truth of nature, distinguishes and orders these parts in such a manner as is conceived by the blind and sordid vulgar, approved by those who speak without considering, preached by him who says much and thinks little? Who, moreover, will believe the opinion of Plato — learned from the *Timaeus*, from Pythagoras, and others — which declares that we dwell in the concave and dark [part] of the earth, and have that relation to the animals which are above the earth which fishes have to us? For, as these live in a humid thicker and grosser than ours, so we live in an air more vaporous than do those who are in a purer and more tranquil region; and, as the Ocean is, to the impure air, water, so our murky [air] is such to that other truly pure [air]. From which sense and saying, what I wish to infer is this: that the sea, the fountains, the rivers, the mountains, the stones, and the air contained in them, and comprehended in them up to the middle region (as they call it), are nothing but dissimilar parts and members of one same body, of one same mass, much proportional to the parts and members which we vulgarly know in composite animals: of which body the term, convexity, and last surface is bounded by the extreme margins of the mountains and the tempestuous air; so that the Ocean and the rivers remain in the deep of the earth no less than the liver — esteemed the fountain of the blood — and the ramified veins are contained and extended through the more particular [members].

BURCH. Then the earth is not the most heavy body, and therefore [is] in the middle, next to which — heavier and nearer — is the water that surrounds it, which is heavier than the air?

FRAC. If you judge the heavy by the greater aptitude to penetrate the parts and make its way to the middle and to the centre, I will say that the air is the most heavy, and the air is the most light, of all these called elements. For, as every part of the earth, if space be given it, descends to the middle, so the parts of the air will run more suddenly to the middle than the part of any other

body whatsoever; because it falls to the air to be the first to succeed to the space, to forbid the void, and to fill [it]. Not so suddenly do the parts of the earth succeed to the place, which ordinarily do not move save by penetrating the air; for, to make the air penetrate, neither earth nor water nor fire is required; nor do any of these forerun it, nor overcome it, in being more ready, apt, and expedite to fill the angles of the containing body. Besides, if the earth, which is a solid body, departs, the air will be that which occupies its place: not so apt is the earth to occupy the place of the air that departs. Therefore, it being proper to the air to move to penetrate every site and recess, there is no body lighter than the air, [and] there is no body heavier than the air.

BURCH. Now what will you say of the water?

FRAC. Of the water I have said, and I return to say, that it is heavier than the earth; because we see the humour descend and penetrate the dry [land] to the middle more potently than the dry penetrates the water: and besides, the dry, taken quite without composition of water, will come to float upon the water and to be without aptitude to penetrate within it; and it does not descend unless it be first imbibed with water and condensed into a mass and thick body, by means of which thickness and density it acquires power to make its way within and beneath the water. Which water, on the contrary, will never descend by merit of the earth, but because it aggregates, condenses, and doubles the number of its parts to imbibe and to mass the dry [land]: for we see that a vessel full of truly dry ashes will hold much more water than another equal vessel in which there is nothing. The dry, then, as dry, sits above and floats upon the water.

BURCH. Declare yourself better.

Frac. I return to say that, if all the water were removed from the earth, in such wise that there remained pure dry [land], it would necessarily be that the remainder were an inconstant, rare, dissolute body, easy to be dispersed through the air — nay, in the form of innumerable discontinued bodies; because that which makes one continuum is the air; that which, by cohesion, makes one continuum is the water, be it of the continued, coherent, and solid, which is now the one, now the other, now the composite of the one and the other. Where, if gravity proceeds from nothing else than from the cohesion

and thickness of the parts, and those of the earth have no cohesion together save by the water — whose parts, like those of the air, unite of themselves, and which has more virtue than any other (if it has not a singular virtue) to make the parts of other bodies unite together — it will come about that the water, with respect to other bodies that by it become heavy, and by which another acquires its being ponderous, is primarily heavy. Therefore those were not to be esteemed mad, but much more wise, who said that the earth is founded upon the waters.

BURCH. We say that in the middle the earth must ever be understood [to be], as so many most learned personages have concluded.

FRAC. And the mad ones confirm it.

BURCH. What do you say of the mad?

Frac. I say that this saying is confirmed neither by sense nor by reason.

BURCH. Do we not see the seas have flux and reflux, and the rivers make their course over the face of the earth?

FRAC. Do we not see the fountains — which are the beginning of the rivers, which make the lakes and seas — issue from the bowels of the earth, and not come forth from out of the bowels of the earth, if indeed you have grasped what a little while ago I have many times said?

BURCH. We see the waters first descend from the air, before the fountains come to be formed by the waters.

FRAC. We know that the water — if indeed it descend from another air than that which is part and appertaining to the members of the earth — first, originally, principally, and totally is in the earth; [and] that afterward, derivatively, secondarily, and particularly, it is in the air.

Burch. I know that you stand upon this: that the true outermost surface of the convex of the earth is not taken from the face of the sea, but from the air level with the highest mountains.

FRAC. So your prince Aristotle also affirmed and confirmed.

BURCH. This prince of ours is, beyond comparison, more celebrated and worthy and followed than yours, which is not yet known nor seen. Yet,

however much yours pleases you, mine does not displease me.

FRAC. Though he let you die of hunger and cold, feed you on wind, and send you barefoot and naked.

PHIL. Of your grace, do not stay upon these useless and vain matters.

FRAC. So we shall do. What, then, do you say, O Burchio, to this that you have heard?

Burch. I say that, be it as it will, at the last one must see what is in the middle of this mass, of this your star, of this your animal. For, if there be pure earth there, the manner in which these [men] have ordered the elements is not vain.

Frac. I have said and demonstrated that more reasonably there is air or water there than the dry; which, indeed, will not be there without being composed with more parts of water, that at last come to be its foundation; for we see the particles of water penetrate the earth more potently than the particles of this penetrate that. It is, then, more likely — nay, necessary — that in the bowels of the earth there be water, than that in the bowels of the water there be earth.

BURCH. What do you say of the water that floats and runs over the earth?

FRAC. There is no one who cannot see that this is by the benefit and work of the water itself: which, having thickened and fixed the earth, by constipating the parts of it, makes it so that the water is not further absorbed — which otherwise would penetrate to the depth of the dry substance, as we see by universal experience. It is needful, then, that in the middle of the earth there be water, to the end that that middle have firmness, which must not be referred to the earth first, but to the water: for this makes united and joined the parts of that, and consequently this rather works the density in the earth, than, on the contrary, the earth be the cause of the cohesion of the parts of the water and make those dense. If, then, in the middle you will not have it composed of earth and water, it is more likely and conformable to every reason and experience that there be rather water than earth. And if there be a thick body, it is greater reason that in it the water predominate than the dry, because the water is that which makes the thickness in the parts of the earth; which thickness is dissolved by heat (I do not say so of the thickness that is in the first fire, which is dissoluble by its contrary): so that, the thicker and heavier it is,

the more participation of water it knows. Whence the things that are near us most thick are not only esteemed to have more participation of water, but besides are found to be water itself in substance, as appears in the resolution of the heavier and thicker bodies that are the liquefiable metals. And in truth in every solid body that has coherent parts, the water is understood [to be present] which joins and couples the parts, beginning from the least [parts] of nature; in such wise that the dry, quite dissolved from the water, is nothing but vague and dispersed atoms. Therefore the parts of the water are more consistent without the earth, because the parts of the dry are in no way consistent without the water. If, then, the middle place is destined to that which runs to it with greater impulse and more velocity, it falls first to the air, which fills the whole; second, to the water; third, to the earth. If it be destined to the first heavy, to the densest and thickest, it falls first to the water, second to the air, third to the dry. If we take the dry joined to the water, it falls first to the earth, second to the water, third to the air. So that, according to diverse and several reasons, the middle falls first to diverse [things]; [but] according to truth and nature, the one element is not without the other, and there is no member of the earth — I say of this great animal — wherein there are not all four, or at least three of them.

BURCH. Now come quickly to the conclusion.

FRAC. That which I wish to conclude is this: that the famous and vulgar order of the elements and mundane bodies is a dream and a most vain fancy; because neither is it verified by nature, nor proved and argued by reason, nor ought it [to be so] by fitness, nor can it [be so] by power. It remains, then, to know that there is an infinite field and containing space, which comprehends and penetrates the whole. In that are infinite bodies like this, of which the one is no more in the middle of the universe than the other, because it is infinite, and therefore without centre and without margin; although these [terms] befit each of these worlds that are in it, in that manner I have at other times told — and particularly when we demonstrated there to be certain, determinate, and defined middles, such as are the suns, the fires, about which course all the planets, the earths, the waters, even as we see, about this [sun] near us, these seven wanderers march; and as when we likewise demonstrated that each of these stars or worlds, turning about its own centre, causes the appearance of a

solid and continuous world that snatches along [with it] as many stars as are seen and can be, and turns about it as the centre of the universe. So that there is not one sole world, one sole earth, one sole sun; but as many are the worlds as we see luminous lamps about us, which are no more and no less in one heaven and one place and one comprehending [body], than this world, wherein we are, is in one comprehending [body], place, and heaven. So that the heaven, the infinite immense air, although it be part of the infinite universe, is not, however, a world, nor part of worlds; but the bosom, the receptacle, and the field in which those are, move, live, vegetate, and put into effect the acts of their vicissitudes — produce, feed, refeed, and maintain their inhabitants and animals; and, with certain dispositions and orders, minister to the superior nature, changing the face of one being into innumerable subjects. So that each of these worlds is a middle, toward which each of its parts concurs, and where every kindred thing reposes; as the parts of this star, from a certain distance and from every side and surrounding region, report themselves to their container. Whence, having no part that so flows out from the great body but that it flows back again into it, it comes about that it is eternal, although it be dissoluble: though the necessity of such eternity be certainly from the extrinsic maintainer and provident [one], not from the intrinsic and proper sufficiency — if I am not deceived. But of this, with more particular reason, I will at other times make you understand.

BURCH. So, then, the other worlds are inhabited as this is?

FRAC. If not so, and if not better, [yet] no less and no worse: for it is impossible that a rational and somewhat awakened wit could imagine that those innumerable worlds — which show themselves either thus or more magnificent than this — should be deprived of like and better inhabitants; which worlds are either suns, or [worlds] to which the sun no less diffuses the most divine and fecund rays that argue happy their proper subject and fountain than they render fortunate the surrounding partakers of such diffused virtue. There are, then, infinite innumerable and principal members of the universe, of the same countenance, face, prerogative, virtue, and effect.

BURCH. Will you not have it that between some and others there be any difference?

FRAC. You have many times heard that those are of themselves luminous and hot, in the composition of which the fire predominates; the others shine by another's participation, [and] are of themselves cold and dark, in the composition of which the water predominates. From which diversity and contrariety depend the order, the symmetry, the complexion, the peace, the concord, the composition, the life. So that the worlds are composed of contraries; and the one [set of] contraries, such as the earths and waters, live and vegetate by the other contraries, such as the suns and fires. Which, I believe, that sage understood who said that God makes peace among His sublime contraries; and that other who understood the whole to be subsistent by the strife of concordant [things] and the love of contending [things].

BURCH. With this saying of yours you would set the world upside down.

FRAC. Does it seem to you that he would do ill who should wish to set upright the world [that has been] turned upside down?

BURCH. Will you make vain so many labours, studies, [and] sweats of physical lectures, of the heavens and worlds, whereupon so many great commentators, paraphrasts, glossators, compendiarists, summists, scholiasts, translators, questionists, and theorematisers have racked their brains? whereupon the profound, subtle, gilded, great, inexpugnable, irrefragable, angelic, seraphic, cherubic, and divine doctors have laid their bases and cast their foundations?

FRAC. Add the rock-breakers, the stone-splitters, the horn-butters, and the heel-mighty; add the deep-seers, the palladians, the olympians, the firmamentals, the celestial empyreans, the high-thunderers.

BURCH. Shall we have to send them all, at your instance, into a privy? Certainly the world will be well governed, if the speculations of so many and so worthy philosophers shall be taken away and despised!

FRAC. It is not a just thing that we should take from the asses their lettuces, and wish that the taste of these be like ours. The variety of wits and intellects is no less than that of spirits and stomachs.

BURCH. Will you have it that Plato is an ignoramus, Aristotle an ass, and those who have followed them senseless, stupid, and fanatic?

FRAC. My son, I do not say that these are the colts and those the asses, these the she-apes and those the great apes, as you would have me say; but, as I told you from the beginning, I esteem them heroes of the earth; only I will not believe them without cause, nor admit to them those propositions whose contradictories — as you may have grasped, unless you are quite blind and deaf — are so expressly true.

BURCH. Now who shall be the judge of this?

FRAC. Every regulated sense and awakened judgment; every discreet and less obstinate person, when he shall know himself convinced and impotent to defend the reasons of those [men] and to resist ours.

BURCH. When I shall not know how to defend them, it will be by the defect of my insufficiency, not of their doctrine; when you, impugning them, shall know how to conclude, it will not be by the truth of the doctrine, but by your sophistical importunities.

Frac. I, if I knew myself ignorant of the causes, would abstain from giving sentences. If I were affected as you are, I should esteem myself learned by faith and not by knowledge.

BURCH. If you were better affected, you would know that you are a presumptuous ass, a sophist, a perturber of good letters, an executioner of wits, a lover of novelties, an enemy of truth, suspect of heresy.

PHIL. Up to now this man has shown that he has little doctrine; now he would have us know that he has little discretion, and is not endowed with civility.

ELP. He has a good voice, and disputes more vigorously than if he were a sandalled friar. My dear Burchio, I much praise the constancy of your faith. From the beginning you said that, even though this were true, you would not believe it.

BURCH. Yes; I would rather be ignorant with many illustrious and learned [men] than know with few sophists, such as I esteem these friends to be.

FRAC. Ill will you be able to make a difference between the learned and sophists, if we are to believe what you say. They are not illustrious and learned

who are ignorant; those who know are not sophists.

Burch. I know that you understand what I wish to say.

ELP. It would be much if we could understand what you say, for you yourself will have great trouble to understand what you wish to say.

BURCH. Go, go, [you that are] more learned than Aristotle; away, away, more divine than Plato, more profound than Averroes, more judicious than so great a number of philosophers and theologians of so many ages and so many nations, who have commented on them, admired them, and set them in heaven! Go, you, who — I know not who you are nor whence you come — would presume to oppose yourselves to the torrent of so many great doctors!

FRAC. This would be the best of all you have made, if it were a reason.

BURCH. You would be more learned than Aristotle, if you were not a beast, a poor wretch, a beggar, a miserable creature, nourished on millet bread, dead of hunger, begotten by a tailor, born of a washerwoman, nephew to Cecco the cobbler, son of Momus, postilion of harlots, brother of Lazarus who makes shoes for the asses. Stay [there] with a hundred devils, you too, who are not much better than he!

ELP. Of your grace, magnificent sir, take no further trouble to come and find us; and await rather that we come to you.

FRAC. To wish to show the truth to such [men] by many reasons is as if, with several sorts of soap and lye, one were many times to wash the head of the ass; where one profits no more by washing a hundred times than once, no more in a thousand [ways] than in one, where it is all one to have washed and not.

PHIL. Nay, that head will ever be esteemed more sordid at the end of the washing than at the beginning and before: for, by adding more and more water and perfumes, one comes more and more to stir up the fumes of that head, and comes to smell that stench which was not otherwise smelt; the which will be the more troublesome the more it is awakened by aromatic liquors. — We have said much today; I rejoice much in the capacity of Fracastorio, and in your mature judgment, Elpino. Now, since we have discoursed concerning the being, the number, and the quality of the infinite worlds, it is well that tomorrow we see whether there be contrary reasons, and

what they are.

ELP. So be it.

FRAC. Adieu.

The Fourth Dialogue

Interlocutors: Filoteo, Elpino, Fracastorio.

PHIL. The worlds are not, then, infinite in the manner whereby one imagines the composite of this earth surrounded by so many spheres — of which some contain a single star, others innumerable stars: seeing that the space is such that through it so many stars can range; each of these is such that it can, of itself and from an intrinsic principle, move toward the communication of fitting things; each of them is so great that it is sufficient, capable, and worthy to be esteemed a world; there is none of them that has not an efficacious principle and means of continuing and preserving the perpetual generation and life of innumerable and excellent individuals. Once it shall be known that the appearance of the mundane motion is caused by the true diurnal motion of the earth (which is likewise found in similar stars), there will be no reason to constrain us to esteem the equidistance of the stars, which the vulgar understand as nailed and fixed in an eighth sphere; nor will there be persuasion to hinder us from knowing that, of the distance of those innumerable [stars], there are innumerable differences of length of semidiameter. We shall comprehend that the orbs and spheres are not disposed in the universe so as to comprehend one another, the lesser ever and ever contained within the greater — as, for example, the coats within each onion; but that, through the etheric field, the heat and the cold, diffused by the bodies principally such, come so to temper themselves together according to diverse degrees, that they make themselves the proximate principle of so many forms and species of being.

ELP. Up, of your grace, let us come quickly to the resolution of the reasons of the adversaries, and especially of Aristotle, which are the most celebrated and most famous, esteemed by the foolish multitude as perfect demonstrations. And, to the end that it may not seem that anything is left behind, I will report all the reasons and opinions of this poor sophist, and you will consider them

one by one.

PHIL. So let it be done.

ELP. “It is to be seen,” he says in the first book of his *On the Heavens and the World*, “whether outside this world there be another.”

PHIL. Concerning such a question you know that he takes the name of “world” differently from us; for we join world to world, as star to star, in this most spacious etheric bosom, as is fitting also that all those sages understood it who esteemed worlds innumerable and infinite. He takes the name of “world” for an aggregate of these disposed elements and fantastic orbs up to the convex of the *primum mobile* — which, formed of a perfect round figure, with most rapid sweep turns the whole about, itself turning, about the centre toward which we are. It will, then, be a vain and childish pastime if we wish, reason by reason, to have regard to such a fantasy; but it will be well and expedient to resolve his reasons insofar as they can be contrary to our sense, and to have no regard to that which does not make war upon us.

FRAC. What shall we say to those who should reproach us that we dispute upon an equivocation?

PHIL. We shall say two things: that the fault of this is in him who has taken “world” according to an improper signification, forming for himself a fantastic corporeal universe; and that our replies are no less valid supposing the signification of “world” according to the imagination of the adversaries than according to the truth. For where one understands the points of the ultimate circumference of this world, of which the middle is this earth, one can understand the points of innumerable other earths that are beyond that imagined circumference; they being there really, although not according to the condition imagined by these [men] — which, be it as it will, neither adds to nor takes from a whit of that which bears upon the quantity of the universe and the number of worlds.

FRAC. You say well; continue, Elpino.

ELP. “Every body,” he says, “either moves or stays still: and this motion and rest is either natural or violent. Besides, every body, where it does not stay by violence but naturally, there it does not move by violence but by nature; and

where it does not move violently, there it naturally resides: so that all that is violently moved upward naturally moves downward, and contrariwise. From this it is inferred that there are not many worlds, when we shall consider that, if the earth which is outside this world moves to the middle of this world violently, the earth which is in this world will move to the middle of that one naturally; and if its motion from the middle of this world to the middle of that be violent, its motion from the middle of that world to this will be natural. The cause of this is that, if there are many earths, one must say that the power of the one is like the power of the other; as, besides, the power of that fire will be like the power of this. Otherwise the parts of those worlds will be like the parts of this in name only, and not in being; and, consequently, that world will not be [a world], but will be called a world, like this. Besides, all the bodies that are of one nature and one species have one motion; for every body naturally moves in some manner. If, then, there are earths there, as is this one, and they are of the same species with this, they will certainly have the same motion; as, contrariwise, if there is the same motion, they are the same elements. This being so, necessarily the earth of that world will move to the earth of this, the fire of that to the fire of this. Whence it follows further that the earth no less naturally moves upward than downward, and the fire no less downward than upward. Now, such things being impossible, there must be one earth, one centre, one middle, one horizon, one world.”

PHIL. Against this we say that, in that manner whereby in this universal infinite space our earth dwells about this region and occupies this part, in the same [manner] the other stars occupy their parts and dwell about their regions in the immense field. Where, as this earth consists of its members, has its alterations, and has flux and reflux in its parts (as we see happen in animals — humours and parts, which are in continual alteration and motion), so the other stars consist of members likewise affected. And as this [earth], moving naturally according to its whole machine, has no motion save such as is like the circular, whereby it turns about its own centre and ranges around the sun, so necessarily [do] those other bodies that are of the same nature. And the sole parts of those [bodies] that by some accidents are removed from their place (which, however, must not be esteemed principal parts or members) naturally return thither with their proper impulse — no otherwise than [do] the parts of

the dry [land] and of the water that, by the action of the sun and of the earth, had removed themselves in the form of exhalation and vapour toward the upper members and regions of this body, [and], having recovered their proper form, return thither. And so those parts do not, beyond a certain term, depart from their container, even as these [of ours]; as will be manifest when we shall see that the matter of comets does not appertain to this globe. So, then, as the parts of one animal, although they be of the same species with the parts of another animal — nevertheless, because they appertain to diverse individuals, never do those of this [animal] (I speak of the principal and distant [parts]) have inclination to the place of those of the others: as my hand will never befit your arm, [nor] your head my torso. These foundations being laid, we say that there is truly similitude among all the stars, among all the worlds, and that this and the other earths have the same reason. Yet it does not follow that where this world is, all the others must be; where this is situated, the others must be situated; but it may well be inferred that, as this [earth] subsists in its place, all the others subsist in theirs: as it is not good that this one should move to the place of the others, [so] it is not good that the others should move to the place of this; as this is different in matter and other individual circumstances from those, [so] those are different from this. So the parts of this fire move to this fire, as the parts of that [move] to that; so the parts of this earth [move] to this whole, as the parts of that earth to that whole. So the parts of that earth which we call moon, with its waters, would against nature and violently move to this [earth], as the parts of this would move to that. That [earth] naturally dwells in its place and holds its region which is there; this is naturally in its region here; and so its parts refer themselves to that earth, as these [refer themselves] to this; so understand of the parts of those waters and of those fires. The “down” and lower place of this earth is not any point of the etheric region outside and beyond it (as happens to the parts made outside their proper sphere, if this come to pass), but is in the centre of its mass, or roundness, or gravity. So the “down” of that earth is not any place outside it, but is its proper middle, its proper centre. The “up” of this earth is all that which is in its circumference and outside its circumference; so, then, the parts of that [earth] move violently outside its circumference and naturally gather themselves toward its centre, as the parts of this violently depart and naturally return

toward their proper middle. See how the true similitude between these and those other earths is to be taken.

ELP. Very well do you say that, as it is an inconvenient and impossible thing that one of these animals should move and dwell where the other is, and not have its proper individual subsistence with its proper place and circumstances; so it is most inconvenient that the parts of this [one] should have inclination and actual motion to the place of the parts of that.

PHIL. You understand well of the parts that are truly parts. For, as appertains to the first indivisible bodies, of which originally the whole is composed, it is to be believed that through the immense space they have a certain vicissitude, whereby they flow in here and flow away elsewhere. And these, if indeed by divine providence, according to act, they do not constitute new bodies and dissolve the old, at least have such a faculty. For truly the mundane bodies are dissoluble; but it may be that, whether by intrinsic or extrinsic virtue, they are eternally persistent the same, by having as much influx as they have efflux of atoms; and so they persevere the same in number, as do we, who in the corporeal substance likewise, day by day, hour by hour, moment by moment, renew ourselves by the attraction and digestion that we make from all the parts of the body.

ELP. Of this we shall speak at other times. As to the present, you satisfy me much also by what you have noted — that thus every other earth would be understood to mount violently to this, if it moved to this place, as this would mount violently if it moved to any of those. For, as from every part of this earth toward the circumference or last surface, and going toward the hemispheric horizon of the ether, one proceeds as if upward; so from every part of the surface of other earths toward this, an ascent is understood: seeing that this earth is as circumferential to those as those to this. I approve that, although those earths be of the same nature with this, it does not therefore follow that they refer themselves to quite the same centre; for thus the centre of another earth is not the centre of this, and its circumference is not the circumference of this — as my soul is not yours; my gravity, and that of my parts, is not your body and gravity; although all such bodies, gravities, and souls be univocally [so] called, and be of the same species.

PHIL. Good. But I would not for this have you imagine that, if the parts of that earth approached this earth, it would not be possible that they should likewise have impulse to this container, as if the parts of this drew near to that; although ordinarily we do not see the like come to pass in animals and diverse individuals of the species of these bodies, save insofar as the one is nourished and augmented by the other, and the one is transmuted into the other.

ELP. It is well. But what will you say if all that sphere were as near to this as it happens that its parts, which have aptitude to come back to their container, remove themselves from it?

PHIL. Granting that the notable parts of the earth make their way outside the circumference of the earth — about which it has been said the air is pure and clear — I easily grant that from that place such parts can come back as if naturally to their place; but not that a whole other sphere should come, nor that the parts of it should naturally descend, but rather ascend violently; as the parts of this would not naturally descend to that, but by violence would ascend. For to all the worlds the exterior of its circumference is the “up,” and the intrinsic centre is the “down”; and the reason of the middle to which their parts naturally tend is not taken from without, but from within them — as those have been ignorant who, feigning a certain margin and vainly defining the universe, have esteemed the middle and centre of the world and of this earth to be the same. Of which the contrary is concluded, famous, and conceded among the mathematicians of our times, who have found that the centre of the earth is not equidistant from the imagined circumference of the world. I leave aside the others, more wise, who, having grasped the motion of the earth, have found — not only by reasons proper to their art, but also by some natural reason — that of the world and universe which we can comprehend with the sense of the eyes, more reasonably, and without incurring inconveniences, and by forming a theory more accommodated and just, applicable to the more regular motion of the said wanderers about the middle, we ought to understand the earth to be as far from the middle as the sun. Whence easily, by their own principles, they have the means to discover little by little the vanity of that which is said of the gravity of this body, and of the difference of this place from the others, of the equidistance of innumerable worlds (which we see from this [earth] beyond the said planets),

of the most rapid motion rather of all those about this one, than of the turning of this one to the aspect of all those; and they will be able to become suspicious, at least, concerning other most solemn inconveniences that are supposed in the vulgar philosophy. Now, to come to the purpose whence we departed, I return to say that neither the whole of the one nor a part of the one would be apt to move toward the middle of the other, however near another star were to this — so that the space or point of the circumference of that should touch the point or space of the circumference of this.

ELP. The provident nature has disposed the contrary of this; for, if it were so, one contrary body would destroy the other; the cold and humid would slay one another with the hot and dry: which, however, being disposed at a certain and fitting distance, the one lives and vegetates by the other. Besides, one similar body would hinder the other from the communication and participation of the fitting [thing] that it gives to the dissimilar and receives from the dissimilar; as the interpositions of another earth, which we call moon, between this and the sun, declare to us at times no mean damages that they bring to our frailty. Now what would it be if it were nearer to the earth, and more notably and at greater length deprived us of that heat and vital light?

PHIL. You say well. Continue now the purpose of Aristotle.

ELP. He brings forward next a feigned response; which says that, for this reason, one body does not move to another — because, insofar as it is removed from the other by local distance, so much does it come to be diverse in nature. And against this he says that the greater and lesser distance is not potent to make the nature be other and other.

PHIL. This, understood as it ought to be understood, is most true. But we have another manner of answering, and we bring forward another reason, whereby one earth does not move to another, near or far as it may be.

Elp. I have understood it. But yet it seems to me besides true — that which is to be believed the ancients meant to say — that a body, by greater distance, acquires lesser aptitude (which they called property and nature, by their frequent manner of speaking); for the parts to which much air is subject are less potent to divide the medium and come below.

PHIL. It is certain, and well enough experienced in the parts of the earth, that from a certain term of their recess and distance they are wont to return to their container; to which they hasten the more, the more they draw near. But we speak now of the parts of another earth.

ELP. Now, earth being like earth, part [like] part, what think you, if they were near? would there not be equal power in the parts of the other to go to the one and the other earth, and consequently to ascend and to descend?

PHIL. One inconvenient thing being granted (if it be inconvenient), what hinders that another consequent [thing] be granted? But, leaving this, I say that the parts, being in equal relation and distance from diverse earths, either remain, or they determine a place to which they go — with respect to which they will be said to descend, and to ascend with respect to the other from which they remove themselves.

ELP. Yet who knows whether the parts of one principal body move to another principal body, though like in species? For it appears that the parts and members of one man cannot square and befit another man.

PHIL. It is true principally and primarily; but accessorially and secondarily the contrary comes to pass. For we have seen by experience that the flesh of another is grafted onto the place where was a nose of this [man]; and we are confident of making the ear of another succeed, most easily, where was the ear of this [man].

ELP. This surgery must not be common.

PHIL. Let it not be.

Elp. I return to the point of wishing to know: if it happened that a stone were in the midst of the air at a point equidistant from two earths, in what manner ought we to believe it would remain fixed? and in what manner would it determine to go sooner to the one than to the other container?

Phil. I say that the stone, by its figure regarding the one no more than the other, and the one and the other having equal relation to the stone, and being precisely affected toward it in the same manner — from the doubt of resolution and the equal reason toward two opposite terms, it would come to pass that it remained [fixed], not being able to resolve to go sooner to the one

than to the other, of which this snatches it no more than that, and it has no greater impulse to this than to that. But if the one be more congenious and connatural to it, and be more either like or apt to conserve it, it will determine, by the shortest path, to refer itself straight to that. For the principal motive principle is not the proper sphere and proper container, but the appetite of self-preservation: as we see the flame creep along the ground, and bend, and bring itself low, to go to the nearest place wherein it may feed and nourish itself; and it will forbear to go toward the sun, to which, without the hazard of cooling along the way, it does not soar.

ELP. What say you of that which Aristotle adds — that the parts and congenious bodies, however distant they be, move yet to their whole and their like?

PHIL. Who does not see that it is against all reason and sense, considered what we have a little while ago said? Certainly the parts outside their proper globe will move to the nearest like, even though that be not their primary and principal container; and at times to another, which conserves and nourishes them, although not like in species; for the intrinsic impulsive principle does not proceed from the relation it has to a determinate place, a certain point, and a proper sphere, but from the natural impulse of seeking where it may better and more readily maintain and conserve itself in its present being — which, however ignoble it be, all things naturally desire. As, most of all, those men desire to live, and most of all those fear to die, who have no light of true philosophy, and apprehend no being save the present, and think that nothing can come to pass that appertains to them. For they have not arrived at understanding that the vital principle consists not in the accidents that result from the composition, but in an individual and indissoluble substance, in which, if there be no perturbation, there befits no desire of conserving oneself, nor fear of dispersing oneself; but this befits the composites — that is, according to the symmetric, complexional, accidental reason. For neither the spiritual substance, which is understood to unite, nor the material, which is understood to be united, can be subject to any alteration or passion, and consequently they do not seek to conserve themselves; and therefore to such substances befits no motion, but [it befits] the composite [ones]. Such doctrine will be comprehended when it shall be known that to be heavy or

light befits not the worlds, nor a part of them; for these differences are not naturally, but positively and respectively. Besides, from that which we have at other times considered — namely, that the universe has no margin, has no extreme, but is immense and infinite — it comes about that the principal bodies, with respect to some middle or extreme, cannot determine to move themselves rectilinearly, because on all sides outside their circumference they have an equal and the same respect: therefore they have no other rectilinear motion than that of their proper parts, [and] not with respect to any other middle and centre than that of their proper whole, container, and perfect [body]. But of this I will consider in its proper place. Coming, then, to the point, I say: that, according to his own principles, this philosopher will not be able to verify that a body, however distant, has aptitude to come back to its container or like, if he understands the comets to be of terrestrial matter; and such matter as, in the form of exhalation, has mounted on high to the incentive region of the fire — which parts are unfit to descend below, but, snatched by the vigour of the primum mobile, circle the earth, and yet are not of quintessence, but most heavy terrestrial bodies, thick and dense. As is clearly argued from the appearance, in so long an interval and long existence as they make, of the heavy and vigorous burning of the fire: that at times they persevere above a month in burning, as in our times one was seen [to do] for forty-five continuous days. Now, if by distance the reason of gravity is not destroyed, for what cause does such a body not only not come below, nor stay still, but moreover circle the earth? If he say that it circles not of itself, but by being snatched; I will insist further that thus also each of his heavens and stars (which he will not have to be heavy, nor light, nor of like matter) are snatched. I leave aside that the motion of these bodies appears proper to them, for it is never conformable to the diurnal [motion], nor to those of other stars.

The reason is excellent to convince these [men] from their own principles. For of the truth of the nature of comets we shall speak, making proper consideration of them — where we shall show both that such kindlings are not from the sphere of the fire (for they would come kindled from every side, seeing that, according to all the circumference or surface of their mass, they are contained in the air rubbed by the heat, as they say, or else the sphere of the fire; but we always see the kindling to be from one side); we shall conclude the

said comets to be a species of star, as the ancients well said and understood; and to be such a star that, by its proper motion drawing near to and removing from this star [the earth] by reason of access and recess, first it seems to grow, as if it were kindled, and then it wanes, as if it were extinguished: and it does not move about the earth; but its proper motion is that which is beyond the diurnal [motion] proper to the earth — which [earth], turning with its own back, comes to make orients and occidents of all those lights that are outside its circumference. And it is not possible that that terrestrial and so great a body can, by so liquid an air and subtle a body which resists nothing at all, be snatched and maintained, against its nature, suspended; whose motion, if it were true, would be conformable only to that of the primum mobile by which it is snatched, and would not imitate the motion of the planets; whence now it is judged of the nature of Mercury, now of the moon, now of Saturn, now of the others. But, of this also, at other times, in its place, we shall speak. It suffices now to have said so much of it as may suffice for an argument against this [man], who from propinquity and distance will not have it inferred [that there is] greater and lesser faculty of the motion which he calls proper and natural, against the truth. Which [truth] does not permit that a [motion] can be called proper and natural to a subject in such a disposition wherein it can never befit it; and therefore, if the parts, from beyond a certain distance, never move to the container, one ought not to say that such motion is natural to them.

ELP. Well does he know who well considers that this [man] had principles all contrary to the true principles of nature. He repeats next that, “if the motion of simple bodies is natural to them, it will come about that the simple bodies which are in many worlds, and are of the same species, move either to the same middle or to the same extreme.”

PHIL. This is what he will never be able to prove — namely, that they ought to move to their same particular and individual [middle]. For from that, that the bodies are of the same species, it is inferred that to them befits a place of the same species and a middle of the same species, which is the proper centre; and one ought not, nor can one, infer that they require a place the same in number.

ELP. He has been somewhat foreknowing of this answer; and therefore, from all his vain effort, he drives this — that he would prove the numerical difference not to be the cause of the diversity of places.

PHIL. Generally we see quite the contrary. Yet say, how does he prove it?

ELP. He says that, if the numerical diversity of bodies were to be the cause of the diversity of places, it would be needful that, of the parts of this earth diverse in number and gravity, each in the same world should have its proper middle. The which is impossible and inconvenient, seeing that according to the number of the individuals of the parts of the earth there would be the number of middles.

PHIL. Now consider what a beggarly persuasion this is. Consider whether for this you can be moved a whit from the contrary opinion, or rather confirmed in it. Who doubts that it is not inconvenient to say that the middle of the whole mass — and of the whole body and animal — is one, to which and toward which all the parts refer themselves, gather themselves, and by which they unite and have their base; and [that] there can be positively innumerable middles, according as, of the innumerable multitude of the parts, in each we can seek or take or suppose the middle? In man the middle is simply one, which is called the heart; and then many others are middles, according to the multitude of the parts, of which the heart has its middle, the lung its [own], the liver its [own], the head, the arm, the hand, the foot, this bone, this vein, this joint, and these particles that constitute such members, and have a particular and determinate site — as much in the first and general [thing], which is the whole individual, as in the proximate and particular, which is this or that other member of the individual.

ELP. Consider that he can be understood not to mean simply that each part has the middle; but that it has the middle to which it moves.

PHIL. In the end all comes to one: for in the animal it is not required that all the parts go to the middle and centre — for this is impossible and inconvenient — but that they refer themselves to it, for the union of the parts and constitution of the whole. For the life and consistency of divisible things is not seen in anything else than in the due union of the parts, which always are understood to have that term which is taken for middle and centre. Therefore,

for the constitution of the whole entire [body], the parts refer themselves to one sole middle; for the constitution of each member, the particles of each refer themselves to the particular middle of each — to the end that the liver may consist by the union of its parts: so the lung, the head, the ear, the eye, and others. See, then, how it is not only not inconvenient, but most natural, that there be many middles according to the reason of many parts and particles of the parts, if you please; for of these is constituted [the whole], subsistent and consistent by the consistency, subsistence, and constitution of the others. Certainly the intellect disdains [to dwell] upon considerations upon such trifles as this philosopher brings forward.

ELP. This must be suffered for the reputation that this [man] has gained — more by not being understood than for aught else. But yet, of your grace, consider a little how much this gallant pleased himself in this wretched little argument. See that, as if triumphing, he adds these words: “If, then, the contradicter cannot contradict these discourses and reasons, necessarily there is one middle and one horizon.”

PHIL. He says very well. Continue.

The Fourth Dialogue continues in Part VII.

(continued) — Filoteo, Elpino, Fracastorio.

ELP. Next he proves that the simple motions are finite and determinate; for that which he said — that the world is one and that the simple motions have their proper place — was founded upon this. He says thus: “Every movable moves from a certain term to a certain term: and there is always a specific difference between the term whence and the term whither, every change being finite; such are sickness and health, smallness [and] greatness, here [and] there; for that which is healed does not tend wherever it will, but to health. The motion of the earth and of the fire, then, are not into infinity, but to certain terms diverse from those places whence they move; for the motion upward is not the motion downward: and these two places are the horizons of the motions. See how the rectilinear motion is determinate. No less determinate is the circular motion; for from a certain term to a certain term, from contrary to contrary, is that also — if we wish to consider the diversity of the motion, which is in the diameter of the circle; for the motion of the whole circle

entirely has no contrary (because it does not terminate at any other point than that whence it began), but [the contrariety is] in the parts of the revolution, when this is taken from one extreme of the diameter to the other opposite.”

PHIL. That motion is determinate and finite according to such reasons, there is no one who denies it or doubts it; but it is false that there is simply a determinate “up” and a determinate “down,” as we have at other times said and proved. For, indifferently, everything moves either hither or thither, wherever be the place of its conservation. And we say (even supposing the principles of Aristotle and others like him) that, if below the earth there were another body, the parts of the earth would remain there violently, and thence would naturally mount. And Aristotle will not deny that, if the parts of the fire were above its sphere (as, for example, where they understand the heaven or cupola of Mercury), they would naturally descend. See, then, how well they naturally determine “up” and “down,” “heavy” and “light,” after you shall have considered that all bodies, wherever they be and wherever they move, retain and seek, as far as possible, the place of their conservation. Nevertheless, although it be true that everything moves through its middles, from and to its terms, and every motion, whether circular or rectilinear, is determined from opposite to opposite — from this it does not follow that the universe is finite in magnitude, nor that the world is one; nor is it destroyed that the motion be infinite (simply, of any particular act whatsoever), whereby that spirit, as we may say, which makes and concurs to this composition, union, and vivification, can be and will ever be in other and other infinite [compositions]. It can stand, then, that every motion be finite (speaking of the present motion, not absolutely and simply of each particular, and in all) and that infinite worlds be: seeing that, as each of the infinite worlds is finite and has a finite region, so to each of those befit prescribed terms of its motion and of its parts.

ELP. You say well; and with this — without there following any inconvenience against us, nor anything that be in favour of those things he wishes to prove — is brought forward that “sign” which he adds to show “that the motion is not into infinity, because the earth and the fire, the more they approach their sphere, the more swiftly they move; and therefore, if the motion were into infinity, the velocity, lightness, and gravity would come to be into infinity.”

PHIL. Much good may it do him.

FRAC. Yes. But this seems to me the game of the cups-and-balls; for, if the atoms have infinite local motion by the local succession that from time to time they make — now having efflux from this [body], now influx into that, now joining themselves to this, now to that composition, now concurring in this, now in that configuration, through the immense space of the universe — they will certainly come to have infinite local motion, to range through infinite space, and to concur in infinite alternations. From this it does not follow that they have infinite gravity, lightness, or velocity.

PHIL. Let us leave aside the motion of the first parts and elements, and consider only of the proximate parts determined to a certain species of being — that is, of substance: as of the parts of the earth, which are indeed earth. Of these truly it is said that, in those worlds which are, and in those regions where they dwell, in that form which they hold, they do not move save from a certain to a certain term. And from this there follows no more this conclusion — therefore the universe is finite and the world is one — than this other: therefore the apes are born without a tail, therefore the owls see by night without spectacles, therefore the bats make wool. Besides, understanding of these parts, never will such an inference be possible: the universe is infinite, the earths are infinite; therefore a part of earth could continually move into infinity, and must have, toward an earth infinitely distant, an infinite impulse and an infinite gravity. And this for two causes: of which the one is that this passage cannot be given, because — the universe consisting of contrary bodies and principles — such a part could not range far through the etheric region but that it would come to be overcome by the contrary, and to come to such a state that that earth no longer moves; for that substance is no longer earth, having, by the victory of the contrary, changed its complexion and countenance. The other [cause] is that generally we see that so far is it [from being the case] that ever from an infinite distance there could be an impetus of gravity or lightness, as they say, that such impulse of the parts cannot be save within the region of their proper container; the which [parts], if they were outside it, would no more move there than the fluid humours (which in the animal move from the external parts to the internal, upper and lower, according to all differences, mounting and descending, removing themselves

from this to that and from that to this part) — [when] put outside their proper container, even though contiguous to it — lose such force and natural impulse. Such relation, then, holds for so much space as is measured by the semidiameter from the centre of such particular region to its circumference — where, about this [circumference] is the least gravity, and about that [centre] the greatest; and in the middle, according to the degrees of propinquity to the one or the other, it comes to be greater and lesser; as appears in the present demonstration, in which A signifies the centre of the region, where, speaking commonly, the stone is neither heavy nor light; B signifies the circumference of the region, where likewise it will be neither heavy nor light, and will remain at rest (whence appears also the coincidence of the maximum and minimum, which is demonstrated at the end of the book *On the Cause, Principle, and One*); 1, 2, 3, 4, 5, 6, 7, 8, 9 signify the differences of the intervening spaces:

- B 9 — neither heavy nor light
- 8 — least heavy, lightest
- 7 — much less heavy, much more light
- 6 — less heavy, more light
- 5 — heavy, light
- 4 — more heavy, less light
- 3 — much more heavy, much less light
- 2 — heaviest, least light
- A 1 — neither heavy nor light

Now see, besides, how far it is [from being the case] that one earth should move to another, [since] even the parts of each, put outside their proper circumference, have no such impulse.

ELP. Do you want this circumference to be determinate?

PHIL. Yes, as to the maximum gravity that could be in the greatest part; or, if you please (because the whole globe is neither heavy nor light), in the whole earth. But as to the middle differences of heavy and light, I say that one ought to take so many diverse differences as there can be diverse weights of diverse parts comprehended between the maximum and the minimum heavy.

ELP. Discretely, then, this scale is to be understood.

PHIL. Everyone who has wit will be able of himself to understand the manner. Now, as to the cited reasons of Aristotle, enough is said. Let us now see whether in the following [reasons] he brings forward anything [further].

ELP. Of your grace, be content that we speak of this on the following day; for I am awaited by Albertino, who is disposed to come here to find you tomorrow. From whom I believe you will be able to hear all the most vigorous reasons that for the contrary opinion can be brought forward, he being well enough practised in the common philosophy.

PHIL. Let it be at your convenience.

The Fifth Dialogue

Albertino, a new interlocutor; with Elpino, Filoteo, and Fracastorio.

Alb. I would fain know what phantasm, what unheard-of monster, what heteroclite man, what extraordinary brain this is; what novelties this fellow brings anew to the world; or rather what obsolete and old things come to be renewed, what amputated roots come to sprout again in this our age.

ELP. They are amputated roots that put forth shoots, they are ancient things that come again, they are hidden truths that are discovered: it is a new light that, after a long night, breaks at the horizon and hemisphere of our cognition, and little by little draws near to the meridian of our intelligence.

ALB. If I did not know Elpino, I know [well] what I should say.

ELP. Say but what you please; for, if you have wit, as I believe you have, you will consent to these [doctrines] as I consent to them; if you have a better [wit], you will consent the sooner and the better, as I believe will be the case. Seeing that those to whom the common philosophy and ordinary science are difficult, and who are yet disciples and ill-versed in it (though they esteem not themselves such, as it is often wont to be), it will not be easy that they convert to our opinion; for in such [men] the universal faith can do more, and in them above all the fame of the authors that have been put into their hands triumphs; wherefore they admire the reputation of the expositors and commentators of those [authors]. But the others, to whom the said

philosophy is open, and who are come to that term whence they are no more occupied in spending the remainder of their life in understanding what others say, but have their own light and the eyes of the true active intellect, penetrate every recess; and, like Argus, with the eyes of diverse cognitions, can contemplate her naked through a thousand doors; they will be able, drawing nearer, to distinguish between that which is believed and held for granted and true (by gazing from afar through the force of custom and the general sense) and that which truly is, and ought to be held for certain, as constant in the truth and substance of things. Ill, I say, will those be able to approve this philosophy who either have not a good felicity of natural wit, or else are not experienced, at least middlingly, in diverse faculties, and are not so potent in the reflex act of the intellect that they know how to make a difference between that which is founded upon faith and that which is established upon the evidence of true principles; for such a thing is commonly held for a principle which, well considered, will be found a conclusion impossible and against nature. I leave aside those sordid and mercenary wits who, little or nothing solicitous about the truth, content themselves to know according as knowing is commonly esteemed; little friends of true wisdom, greedy of the fame and reputation thereof; fond of appearing, little curious of being. Ill, I say, will he be able to choose among diverse opinions and at times contradictory judgments who has not a solid and right judgment concerning them. Hardly will he be able to judge who is not potent to make comparison between these and those, the one and the other. With great pains will he be able to compare the diverse [opinions] together who grasps not the difference that distinguishes them. Right hard it is to comprehend wherein they differ and how these are other than those, the substance and being of each being hidden. This can never be evident if it be not laid open by its causes and principles wherein it has its foundation. After, then, that you shall have looked with the eye of the intellect, and considered with the regulated sense, the foundations, principles, and causes wherein these diverse and contrary philosophies are planted; [and] seen what is the nature, substance, and property of each; [and] weighed with the intellectual balance and seen what difference there is between the one and the other; [and] made comparison between these and those, and rightly judged — without hesitating a whit you will make election

to consent to the truth.

ALB. To be solicitous against vain and foolish opinions is a thing for a vain and foolish [man], says the prince Aristotle.

ELP. Well enough said. But, if you look well, this sentence and counsel will come to be practised against his own opinions, when they shall be openly foolish and vain. He who wishes perfectly to judge must know how to strip himself of the habit of believing; he must esteem the one and the other contradictory equally possible, and quite lay aside that affection wherewith he is imbued from birth — as much that which presents itself to us in the general conversation [of mankind], as that other whereby, through the medium of philosophy, we are reborn, dying to the vulgar, [and] reputed among the studious wise by the multitude, and at one time. I mean, when controversy arises between these and others esteemed wise by other multitudes and other times, if we wish rightly to judge, we ought to recall to mind that which the same Aristotle says — that, for having regard to few things, we at times easily cast our sentences; and besides, that opinion at times, by the force of custom, so masters our consent that such a thing seems to us necessary which is impossible; [and] such a thing we discern and apprehend as impossible which is most true and necessary. And if this comes to pass in things by themselves manifest, what must it be in those that are doubtful and have dependence upon well-laid principles and well-settled foundations?

ALB. It is the opinion of the commentator Averroes, and of many others, that one cannot know that which Aristotle was ignorant of.

ELP. This [man], with such a multitude, was set so low in wit, and they were in shadows so thick, that the highest and clearest [thing] they saw was Aristotle. Yet if this [man] and others, when they let fall such a sentence, would speak more chastely, they would say that Aristotle is a god, according to their opinion; whence they come not so much to magnify Aristotle as to set forth their own dullardry; for this is no otherwise [so], according to their opinion, than [it is], according to the opinion of the ape, that the most beautiful creatures of the world are her offspring, and the comeliest male upon the earth is her great ape.

ALB. Parturient montes...

ELP. You shall see that what is born is no mouse.

ALB. Many have shot bolts and machinated against Aristotle; but the castles have fallen, the arrows have been blunted, and their bows broken.

ELP. What of it, if one vanity makes war against another? The one is potent against all [the rest]; not for this does it lose the being of a vanity; and in the end will it not be able to be discovered and vanquished by the truth?

Alb. I say that it is impossible to contradict Aristotle demonstratively.

ELP. This is a too-precipitous saying.

Alb. I say it not save after having seen well, and considered much better, what Aristotle says. And in him so far am I from finding any error, that I discern nothing in him that savours not of divinity; and I believe that one cannot perceive aught else than what I have not been able to perceive.

ELP. Then you measure the stomach and brain of another according to your own, and believe that to be impossible to others which is impossible to you. There are in the world some so unfortunate and unhappy that, besides being deprived of every good, they have, by decree of fate, for an eternal companion such an Erinys and infernal fury that makes them voluntarily, with the black veil of corrosive envy, to film over their eyes, that they may not see their own nakedness, poverty, and misery, and the ornaments, riches, and felicities of others: they would rather pine away in filthy and proud penury, and lie buried under the dung of pertinacious ignorance, than be seen converted to a new discipline, it seeming to them a confession of having been until then ignorant, and of having such a one for a guide.

ALB. Would you then have me, *verbi gratia*, make myself the disciple of this fellow? I, who am a doctor approved by a thousand academies, and who have exercised public profession of philosophy in the first academies of the world — am I now to come to renounce Aristotle, and have myself taught philosophy by such [men]?

Elp. I, for my part, not as a doctor but as an unlearned man, would wish to be taught; not as that which I ought to be, but as that which I am not, would I wish to learn; I would accept for master not only this [man], but whomsoever the gods have ordained that he be to me, because they make him understand

that which I understand not.

ALB. Would you then make me grow a boy again?

ELP. Rather, unmake the boy in you.

ALB. Great thanks to your courtesy, since you pretend to advance me and set me in exaltation by making me an auditor of this troubled [man] — who everyone knows how much he is hated in the academies, being adversary of the common doctrines; praised by few, approved by none, persecuted by all.

ELP. By all, yes, but [by] such-and-such; by few, yes, but the best and heroes. Adversary of common doctrines, not for their being doctrines, or for their being common, but because false. By the academies hated, because where is unlikeness, there is no love; troubled, because the multitude is contrary to him who sets himself outside it; and he who places himself on high makes himself a butt for many. And, to describe to you his mind, as touching the matter of treating speculative things, I tell you that he is not so curious to teach as to understand; and that he will hear better news, and take greater pleasure, when he shall feel that you wish to teach him (provided he have hope of the effect), than if you should tell him that you wish to be taught by him; because his desire consists more in learning than in teaching, and he esteems himself more apt to that than to this. But here he is, just in time, together with Fracastorio.

ALB. Be very welcome, Filoteo.

PHIL. And you well met.

ALB. If in the forest I ruminate hay and straw
With the ox, the ram, the goat, the ass, and the horse,
Now, to make a better life, without fail,
Hither I come to make myself a catechumen.

FRAC. Be welcome.

ALB. So much, until the present, have I esteemed your positions, that I have believed them unworthy of being heard, much less of a reply.

PHIL. In like manner I judged in my first years, when I was occupied in Aristotle, up to a certain term. Now, after I have seen and considered more, and with more mature discourse ought to be able to judge of things, it may be

that I have unlearned and lost my brain. Now, because this is an infirmity which none feels less than the sick man himself, I — rather moved by a suspicion, promoted from doctrine to ignorance — am much content to have fallen in with such a physician as is esteemed by all sufficient to free me from such a mania.

ALB. Nature cannot do it, nor can I do it,
If the malady has penetrated even to the bone.

FRAC. Of your grace, sir, first feel his pulse and see his water; for afterward — and [if] we cannot effect the cure — we shall stand upon the judgment.

ALB. The manner of feeling the pulse is to see how you will be able to resolve and extricate yourselves from certain arguments, which I will presently make you hear, [and] which necessarily conclude the impossibility of many worlds; so far [are they] from the worlds being infinite.

PHIL. You will lay me under no small obligation when you shall have taught me this; and although your intent succeed not, I shall yet be your debtor for that wherein you will come to confirm me in my opinion. For, certainly, I esteem you such that through you I shall be able to perceive all the force of the contrary [position]; and, as one who is most expert in the ordinary sciences, you will easily be able to descry the vigour of the foundations and edifices of those [sciences], by the difference they have from our principles. Now, that there fall out no interruption of reasonings, and that each at fair leisure may explicate himself wholly, may it please you to bring forward all those reasons which you esteem most solid and principal, and which seem to you demonstratively to conclude.

ALB. So I will do.

First, then, from this: that outside this world no place or time is understood; for one speaks of a first heaven and a first body, which is most distant from us, the *primum mobile*; whence we have, by custom, to call “heaven” that which is the supreme horizon of the world, where are all the immobile, fixed, and quiet things, which are the intelligences that move the orbs. Again, dividing the world into celestial body and elemental, one posits the latter terminated and contained, the former terminating and containing: and such is the order

of the universe that — mounting from the grosser body to the more subtle — that which is above the convex of the fire, wherein are fixed the sun, the moon, and the other stars, is a quintessence; to which it befits that it go not to infinity (for it would be impossible to reach the *primum mobile*), and that the occurrence of other elements be not repeated (both because these would come to be circumferential, and also because the incorruptible and divine body would come to be contained and comprehended by the corruptible). The which is inconvenient: for to that which is divine befits the reason of form and act, and consequently of comprehending, figuring, terminating; not the manner of terminated, comprehended, and figured matter. Next, I argue thus with Aristotle: “if outside this heaven is any body, either it will be a simple body, or it will be a composite body”; and in whatever manner you say [it], I ask further — either it is there as in a natural place, or as in an accidental and violent place. We show that there is no simple body there; for it is not possible that a spherical body change its place; because, as it is impossible that it change its centre, so it is not possible that it change its site: seeing that it cannot be outside its proper site save by violence; and violence cannot be in it, as much actively as passively. Likewise it is not possible that outside the heaven there be a simple body movable by rectilinear motion: whether it be heavy or light, it cannot be there naturally, seeing that the places of these simple bodies are other than the places that are said to be outside the world. Nor can you say that it is there by accident; for it would come to pass that other bodies be there by nature. Now, it being proved that there are no simple bodies beyond those which come to the composition of this world (which are movable according to three kinds of local motion), it is consequent that outside the world there is no other simple body. If it is so, it is also impossible that there be any composite [body]; for this is made of those, and into those is resolved. So it is a manifest thing that there are not many worlds, because the heaven is unique, perfect, and complete, to which there is not, nor can be, any other like. Hence it is inferred that outside this body there can be neither place, full nor void, nor time. There is no place; for, if this be full, it will contain a body, either simple or composite: and we have said that outside the heaven there is no body, neither simple nor composite. If it be void, then, according to the reason of the void (which is defined a space wherein there can be a body), there will be

able to be [one]; and we have shown that outside the heaven there cannot be a body. There is no time; for time is the number of motion; motion is only of a body; therefore where there is no body, there is no motion, there is no number, nor measure of motion; where this is not, there is no time. Then we have proved that outside the world there is no body, and consequently by us it is demonstrated that there is neither motion nor time there. If it is so, there is neither temporal nor movable [thing] there: and consequently the world is one.

Second, principally from the unity of the mover is inferred the unity of the world. It is a thing granted that the circular motion is truly one, uniform, without beginning and end. If it is one, it is one effect, which cannot be from other than one cause. If, then, the first heaven is one — under which are all the inferior [heavens], which all conspire together in one order — there must be a unique governor and mover. This, being immaterial, is not multipliable in number by matter. If the mover is one, and from one mover there is but one motion, and one motion (whether complex or incomplex) is but in one movable, simple or composite, it remains that the movable universe is one. Therefore there are not many worlds.

Third, principally from the places of movable bodies is concluded that the world is one. Three are the kinds of movable bodies: heavy in general, light in general, and neuter; that is, earth and water, air and fire, and heaven. So three are the places of the movables: lowest and middle, where goes the heaviest body; supreme, most distant from that; and middle, between the lowest and the supreme. The first is heavy, the second neither heavy nor light, the third light. The first appertains to the centre, the second to the circumference, the third to the space that is between this and that. There is, then, one inferior place to which move all the heavy [bodies], be they in whatever world; there is one superior to which refer themselves all the light [bodies] from whatever world; therefore there is one place wherein the heaven dwells, of whatever world it be. Now, if there is one place, there is one world: there are not many worlds.

Fourth, I say [that, granting] there be several middles to which the heavy [bodies] of diverse worlds move, [and] several horizons to which the light

moves; and [that] these places of diverse worlds differ not in species, but only in number: it will then come to pass that middle from middle will be more distant than middle from horizon; but middle and middle agree in species, [whereas] middle and horizon are contraries. Therefore there will be more local distance between those that agree in species than between contraries. This is against the nature of such opposites; for when it is said that the first contraries are maximally distant, this is understood above all of local distance, which ought to be in the sensible contraries. See, then, what follows from supposing that there are many worlds. Therefore such a hypothesis is not only false, but moreover impossible.

Albertino's remaining arguments, and Filoteo's reply, follow in Part IX. (continued) — Albertino's arguments against a plurality of worlds, concluded.

ALB. Fifth, if there are several worlds similar in species, they will have to be either equal or (which comes to the same, for what pertains to the purpose) proportional in quantity; if it is so, no more than six worlds will be able to be contiguous to this [one]: because, without penetration of bodies, just as no more than six spheres can be contiguous to one, so no more than six equal circles, without intersection of lines, can touch another. [Here the original sets a figure: six equal circles, without intersection of their lines, touching a seventh in the middle.]

This being so, it will come to pass that several horizons, in as many points (in which six exterior worlds touch this our world or another), will be about one sole middle. But, since the virtue of the two first contraries must be equal, and from this manner of positing there follows inequality, you will come to make the superior elements more potent than the inferior; you will make those victorious over these, and you will come to dissolve this mass. Sixth, since the circles of the worlds touch one another only at a point, there must necessarily remain a space between the convex of the circle of one sphere and [that of] the other; in which space either there is something that fills it, or nothing. If there is something, certainly it cannot be of the nature of an element [merely] distant from the convex of the circumference; because, as is seen, such a space is triangular, terminated by three arc-lines which are parts of the

circumference of three worlds; and so the middle comes to be more distant from the parts nearer to the angles, and most distant from those [angles], as most openly is seen. It is necessary, then, to feign new elements and a new world, to fill that space, diverse from the nature of these elements and [this] world. Or else it is necessary to posit the void, which we suppose impossible.

Seventh, if there are several worlds, either they are finite or they are infinite. If they are infinite, then the infinite in act is found: the which by many reasons is esteemed impossible. If they are finite, they must be in some determinate number: and upon this we shall go investigating why there are so many, and not more nor less; why there is not yet another, which makes this or that one more; whether they are even or odd; why rather of the one than of the other difference; or else why all that matter which is divided into several worlds has not agglomerated into one world, seeing that unity is better than multitude, the other things being found equal; why the matter, divided into four or six or ten earths, is not rather one great globe, perfect and singular. As, then, in the possible and impossible the finite number is found sooner than the infinite, so between the fitting and the unfitting, more reasonable and according to nature is unity than multitude or plurality. Seventh, in all things we see nature hold herself to economy; for, as she is not deficient in necessary things, so she does not abound in superfluous ones. Being able, then, to put into effect the whole by those works that are in this world, there is no reason that one should feign there to be others. Eighth, if there were infinite worlds, or more than one, they would above all be so for this — that God can make them, or rather [that] they can depend upon God. But although this be most true, it does not therefore follow that they are: because, besides the active potency of God, there is required the passive potency of things. For upon the absolute divine potency does not depend all that much which can be made in nature; seeing that not every active potency is converted into passive [potency], but only that which has a proportioned patient — that is, a subject such that it can receive the whole act of the efficient. And in such manner no caused thing has correspondence to the first cause. For as much, then, as appertains to the nature of the world, there cannot be more than one, although God could make more than one. Ninth, the plurality of worlds is a thing outside reason; because in those there would be no civil goodness, which consists in civil

conversation; and the gods, creators of diverse worlds, would not have done well not to make the citizens of those [worlds] have reciprocal commerce.

Tenth, with the plurality of worlds there comes to be caused an impediment in the work of each mover, or god; for, it being necessary that the spheres touch at a point, it will come to pass that the one cannot move against the other, and it will be a difficult thing that the world be governed by the gods through motion.

Eleventh, from one there cannot proceed a plurality of individuals save by that act whereby nature multiplies itself through division of matter; and this is no other act than [that] of generation. This says Aristotle, with all the Peripatetics: a multitude of individuals under one species is not made save by the act of generation. But those who posit several worlds of the same matter and form in species do not say that the one is converted into the other, nor is generated from the other.

Twelfth, to the perfect no addition is made. If, then, this world is perfect, certainly it requires not that another be added to it. The world is perfect, first, as a species of continuum that is not terminated at another species of continuum; for the indivisible point flows mathematically into a line, which is one species of continuum; the line into a surface, which is the second species of continuum; the surface into a body, which is the third species of continuum. The body does not migrate or pass into another species of continuum; but, if it is a part of the universe, it is terminated at another body; if it is the universe, it is perfect, and is not terminated save by itself. Therefore the world and universe is one, if it must be perfect. — These are the twelve reasons which I wished for now to have brought forward. If you satisfy me in these, I will hold myself satisfied in all.

Filoteo's reply to the twelve arguments begins in Part X.

(continued) — Filoteo's reply to the first four arguments.

PHIL. It behooves, my Albertino, that one who proposes to defend a conclusion should first, if he be not altogether mad, have examined the contrary reasons; as foolish would be a soldier who undertook to defend a fortress without having considered the circumstances and places whence it can

be assaulted. The reasons that you bring forward (if indeed they be reasons) are common enough, and repeated several times by many. To all which it will be most efficaciously answered, only with having considered the foundation of them on the one hand, and on the other the manner of our assertion. The one and the other will be clear to you by the order I shall hold in answering; which will consist in brief words, because, if aught else need be said and explicated, I will leave you to the thought of Elpino, who will repeat to you that which he has heard from me.

ALB. First make me perceive that this can be with some fruit, and not without satisfaction to one who desires to know; for certainly it will not irk me to hear first you, and then him.

PHIL. To wise and judicious men — among whom I number you — it suffices only to show the place of consideration; for of themselves they then go deep upon the judgment of the means whereby one descends to the one and the other contradictory or contrary position. As to the first doubt, then, we say that all that machine goes to the ground, [it being] supposed that there are not those distinctions of orbs and heavens, and that the stars in this immense etheric space move by intrinsic principle, both around their own center and around some other middle. There is no *primum mobile* that really snatches so many bodies around this middle; but rather this one globe causes the appearance of such a snatching. And the reasons of this Elpino will tell you.

Alb. I will hear them willingly.

PHIL. When you shall hear and conceive that that saying is against nature, and this is according to every reason, sense, and natural verification, you will no longer say that there is a margin, an ultimate of the body and motion of the universe; and that it is but a vain fantasy to esteem that there is such a *primum mobile*, such a supreme and containing heaven, rather than a general bosom in which the other worlds subside no otherwise than this terrestrial globe [does] in this space, where it is surrounded by this air, without being nailed and fixed in any other body, and [without] having another base than its own center. And if it shall be seen that this [globe] cannot be proved of another condition and nature — showing no other accidents than those which the surrounding stars show — it ought not to be esteemed [to be] in the middle of the universe

any more than each of those, and it [ought] rather to appear to be encircled by those than those by it; whence at last, this indifference of nature being concluded, there is concluded the vanity of the deferent orbs, the virtue of the moving soul and internal nature that agitates these globes, the indifference of the ample space of the universe, the irrationality of its margin and external figure.

ALB. Things in truth that do not repugn nature can have greater fitness; but they are of most difficult proof, and require the greatest wit to extricate oneself from the contrary sense and reasons.

PHIL. The head once found, most easily will the whole tangle be unraveled. For the difficulty proceeds from one manner, and from one supposed inconvenient: and this is the gravity of the earth, the immobility of it, the position of the primum mobile with seven, eight, or nine or more others, in which are planted, weighted, plastered, nailed, knotted, glued, sculptured, or painted the stars; and [their] not residing in one same space with this star which is the earth, named so by us — which you will hear to be no more, nor less, elemental in region, figure, and nature than all the others, [and] no less movable by intrinsic principle than each of those other divine animate beings.

ALB. Certainly, once this thought shall have entered my head, easily will succeed all the others that you propose to me: you will have, at one and the same time, torn out the roots of one philosophy and planted those of another.

PHIL. So you will despise, by reason, that common sense whereby one vulgarly speaks of a supreme horizon, highest and most noble, the confine of the immobile divine substances that move these feigned orbs; but you will confess at least that it is equally credible that, as this earth is a mobile animal, convertible by intrinsic principle, so are all those others likewise, and not movable according to the motion and conveyance of a body that has no tenacity nor any resistance — rarer and subtler than this air in which we breathe can be. You will consider this saying to consist in pure fantasy, and not to be demonstrable to sense; and ours to be according to every regulated sense and well-founded reason. You will affirm it to be no more likely that the imagined spheres of concave and convex surface are moved, and bring the stars with them, than [it is] true and conformable to our intellect and natural

fitness that — without fearing to fall infinitely downward or mount upward (seeing that in the immense space there is no difference of up, down, right, left, before, and behind) — the ones make their circles around and toward the others, for the reason of their life and consistency, in the manner you shall hear in its place. You will see how, outside this imagined circumference of heaven, there can be a body simple or composite, movable by rectilinear motion; because, as by rectilinear motion move the parts of this globe, so can move the parts of the others, and no less; for this is not made and composed of aught else than the others around this and around the others: this appears to wheel about the others no less than the others about this.

ALB. Now more than ever I perceive that a most tiny error in the beginning causes the greatest difference and discrepancy of error in the end; one simple inconvenient little by little multiplies itself, branching into infinite others, as from a small root [come] great structures and innumerable branches. By my life, Filoteo, I am very desirous that this which you propose to me be proved to me by you, and that, from [my] esteeming it worthy and likely, it be opened to me as true.

Phil. I will do as much as the occasion of the time permits me, remitting many things to your judgment, which until now — not from incapacity, but from inadvertence — have been hidden from you.

ALB. Say all by way of article and of conclusion; for I know that, before you entered into this opinion, you were able very well to examine the forces of the contrary; seeing that I am certain that no less to you than to me are open the secrets of the common philosophy. Continue.

PHIL. There is no need, then, to seek whether outside the heaven there be place, void, or time; for one is the general place, one the immense space, which we may freely call void; in which are innumerable and infinite globes, as there is this in which we live and vegetate. Such a space we call infinite, because there is no reason, fitness, possibility, sense, or nature that should finish it: in it are infinite worlds similar to this, and not differing in kind from this; because there is no reason, nor defect of natural faculty — I say as much of passive as of active potency — for which, as in this space around us they are, so likewise there should not be [worlds] in all the other space, which by nature is not

different and other than this.

ALB. If that which you said first is true (as until now it is no less likely than its contradictory), this is necessary.

PHIL. Outside, then, the imagined circumference and convex of the world is time, because there is the measure and reason of motion, [and] because there are similar movable bodies. And let this be partly supposed, partly proposed, concerning that which you said as the first reason of the unity of the world.

As to that which you said secondly, I tell you that truly there is a first and prince mover, but not in such wise first and prince that, by a certain ladder, through the second, third, and others after that, one can descend, numbering, to the middle and the last: seeing that such movers are not, nor can be; because where there is infinite number, there is no degree nor numerical order, although there be degree and order according to the reason and dignity, either of diverse species and genera, or of diverse degrees in the same genus and the same species. There are, then, infinite movers, even as there are infinite souls of these infinite spheres, which — because they are forms and intrinsic acts (in respect of which all is one prince on whom all depend) — [there] is one first which gives the virtue of motivity to the spirits, souls, gods, numina, [and] movers, and gives mobility to matter, to body, to the animate, to inferior nature, to the movable. There are, then, infinite movables and movers, which all reduce to one passive principle and one active principle, as every number reduces to unity; and the infinite number and unity coincide, and the supreme agent — potent to make all — with the possible-to-be-made-all, coincide in one, as is shown at the end of the book *On the Cause, Principle, and One*. In number, then, and multitude, there is infinite movable and infinite moving [thing]; but in unity and singularity there is infinite immobile mover, infinite immobile universe; and this infinite number and magnitude, and that infinite unity and simplicity, coincide in one most simple and indivisible principle, true, [and] being. So there is not one *primum mobile*, to which in a certain order succeeds the second, until the last, or else into infinity; but all the movables are equally near and far to and from the first and universal mover. As, logically speaking, all the species have equal relation to the same genus, [and] all the individuals to the same species; so, from one universal infinite

mover, in an infinite space, there is one universal infinite motion, on which depend infinite movables and infinite movers, of which each is finite in mass and efficacy. As to the third argument, I say that in the etheric field there is no certain determinate point to which, as to the middle, the heavy things move, and from which, as toward the circumference, the light things depart; because in the universe there is no middle nor circumference, but, if you will, in all is middle, and in every point can be taken part of some circumference in respect of some other middle or center. Now, as to us, relatively we call heavy that which from the circumference of this globe moves toward the middle; light that which, the contrary way, [moves] toward the contrary site; and we shall see that nothing is heavy that is not likewise light; because all the parts of the earth successively change site, place, and temperament, while, through the long course of ages, there is no central part that does not become circumferential, nor circumferential part that does not become of the center, or toward it. We shall see that gravity and levity is nothing else but the appulse of the parts of bodies to their proper container and conservant, wherever it be; therefore it is not situational differences that draw such parts to themselves, nor that send them from themselves, but it is the desire of selfpreservation, which impels every thing as an intrinsic principle, and, if no impediment oppose it, leads it where best it may flee the contrary and join itself to the fitting. So, then, no less from the circumference of the moon and other worlds, similar to this in species or in genus, do the parts go toward the middle of the globe to unite, as by force of gravity; and toward the circumference do the rarefied parts betake themselves, as by force of levity. And it is not because they flee the circumference or cling to the circumference; for, if this were [so], the nearer they approached to it, the more swiftly and rapidly would they run thither; and the farther they removed from it, the more strongly would they hurl themselves to the contrary site. Of which we see the contrary, seeing that, if they shall be moved beyond the terrestrial region, they will remain poised in the air, and will neither mount on high nor descend below, until either they acquire (by apposition of parts, or by thickening from the cold) a greater gravity, whereby, dividing the air beneath, they return to their container; or, dissolved by the heat and rarefied, they disperse into atoms.

ALB. Oh, how this will sit in my soul, when you shall have more plainly made me see the indifference of the stars from this terrestrial globe!

PHIL. This Elpino can easily repeat to you, in the manner whereby he has been able to hear it from me. And he will make you hear more distinctly how heavy and light is no body in respect of the region of the universe, but [a property] of the parts in respect of their whole, proper container, or conservant. For these, by desire of preserving themselves in their present being, move to every local difference, draw themselves together (as do the seas and the drops), and separate themselves (as do all the liquors on the face of the sun, or other fires). For every natural motion that is from an intrinsic principle is naught but to flee the unfitting and contrary, and to follow the friendly and fitting. So nothing moves from its place unless driven by the contrary; nothing in its place is heavy or light; but the earth, raised to the air, while it forces itself toward its place, is heavy and feels heavy. So water, suspended in the air, is heavy; it is not heavy in its proper place. So, to the submerged, all the water is not heavy; and a little vessel full of water, above the air, outside the surface of the dry [land], weighs. The head, to its own torso, is not heavy; but the head of another will be heavy, if it be set upon [one]; the reason whereof is its not being in its natural place. If, then, gravity and levity is appulse to the conserving place and flight from the contrary, nothing naturally constituted is light: and nothing has gravity or levity [when] much distant from its proper conservant, and much removed from the contrary, until it feel the profit of the one and the annoyance of the other; but if, feeling the annoyance of the one, it despair and be perplexed and irresolute of the contrary, by that [annoyance] it comes to be vanquished.

ALB. You promise — and in great part put into effect — great things.

PHIL. To not recite twice the same, I commit to Elpino that he tell you the rest.

Alb. I seem to understand all; for one doubt excites another, one truth shows another: and I begin to understand more than I can explicate; and until now many things I held for certain, I begin to hold for doubtful. Whence I feel myself, little by little, easy to consent to you.

PHIL. When you shall have fully understood me, you will fully consent to me. But, for now, retain this; or at least be not resolved, as you showed yourself, in the contrary opinion, as you were before it was put into controversy. For little by little, and on diverse occasions, we shall come to explicate fully all that can serve the purpose; which depends on several principles and causes: because, as one error is added to another, so to one discovered truth succeeds another.

Concerning the fourth argument, we said that, although there be as many middles as there are individuals — of globes, of spheres, of worlds — it does not therefore follow that the parts of each refer themselves to another middle than their own, nor that they remove themselves toward another circumference than [that] of their own region. So the parts of this earth regard no other center, nor go to unite to another globe than this, as the humors and parts of animals have flux and reflux in their proper subject, and have no appurtenance to another distinct in number.

As to that which you bring [forward] for an inconvenient — namely, that the middle which agrees in species with the other middle will come to be more distant from it than the middle and the circumference, which are naturally contraries, and therefore are and ought to be maximally distant — I answer you, first, that contraries ought not to be maximally distant, but [only] so much that the one may have action on the other and may be patient from the other: as we see the sun disposed near to us in respect of its earths that are around it; seeing that the order of nature brings this — that the one contrary subsist, live, and nourish itself by the other, while the one comes to be affected, altered, vanquished, and converted into the other. Besides, a little ago we discoursed with Elpino of the disposition of the four elements, which all concur to the composition of each globe, as parts whereof the one is set within the other, and the one is mixed with the other; and they are not distinct and diverse, as contained and container, because, wherever is the dry, there is the water, the air, and the fire, [whether] open or latent; and the distinction which we make of globes — of which some are fires, as the sun, [and] some are waters, as the moon and earth — proceeds not from this, that they consist of a simple element, but from this, that such [an element] predominates in such a composition.

Besides, it is most false that contraries are maximally distant; for in all things these come naturally conjoined and united; and the universe — as much according to its principal parts as according to the others consequent — consists not save by such conjunction and union; seeing that there is no part of earth that has not most united in itself the water, without which it has not density, union of atoms, and solidity. Besides, what terrestrial body is so thick that it has not its insensible pores — which, if they were not [there], such bodies would not be divisible and penetrable by the fire, or by the heat thereof, which yet is a sensible thing that departs from such substance? Where, then, is there a part of this your cold and dry body that has not, joined [to it], of this other your humid and hot body? This distinction of elements, then, is not natural, but logical; and if the sun is in its region, far from the region of the earth, the air, the dry [land], and the water are not for that farther from it than from this body: because so [is] that a composite body, as [is] this, although of the four said elements one predominate in that, another in this. Besides, if we will that nature be conformable to this logic which wants the maximum distance to be due to contraries, it will be needful that between your fire, which is light, and the earth, which is heavy, be interposed your heaven, which is neither heavy nor light. Or, if you will yet constrain yourself, saying that you mean this order in the so-called elements, it will be needful, even so, to order them otherwise. I mean that it falls to the water to be in the center and place of the heaviest, if the fire is in the circumference and place of the lightest, in the elemental region; for the water, which is cold and humid, contrary to the fire according to both qualities, ought to be maximally distant from the fire; and the air, which you call hot and humid, ought to be most distant from the cold and dry earth. See, then, how inconstant is this Peripatetic proposition, whether you examine it according to the truth of nature, or measure it according to its own principles and foundations.

Alb. I see it, and very openly.

PHIL. See, too, that our philosophy is not against reason — [our philosophy,] which reduces [all] to one principle, and refers [all] to one end, and makes the contraries coincide, so that there is one first subject of the one and the other; from which coincidence we esteem it at last divinely said and considered that the contraries are in the contraries; whence it is not difficult to attain to so

much that one know how every thing is in every thing: that which Aristotle and other sophists could not grasp.

ALB. Willingly I listen to you. I know that so many and such diverse conclusions cannot be proved together and on one occasion; but, from your discovering [to be] inconvenient the things which I esteemed necessary, in all the others which by the same and like reason I esteem necessary, I become suspicious. Therefore, with silence and attention, I prepare myself to listen to your foundations, principles, and discourses.

Filoteo's reply to the remaining arguments continues in Part XI. (continued)
— Filoteo's reply to the remaining arguments.

ELP. You shall see that it is no golden age which Aristotle has brought to philosophy. For now, let the doubts you have proposed be dispatched.

Alb. I am not very curious about those others, because I long to understand that doctrine of principles by which these and other doubts are resolved according to your philosophy.

PHIL. Of those we shall reason afterward. As to the fifth argument, you must observe that, if we imagine the many and infinite worlds according to that manner of composition which you are wont to imagine — as though, besides a composite of four elements (according to the order vulgarly reported), and eight, nine, or ten other heavens, made of another matter and of a different nature, which contain them and with rapid circular motion wheel about them; and besides such a world, so ordered and spherical, we understood others, and others likewise spherical and likewise mobile — then we should have to give a reason and feign in what manner the one would come to be continuous or contiguous to the other; then we should go fantasizing in how many circumferential points it could be touched by the circumference of the surrounding worlds; then you would see that, although there were several horizons about one world, they would not for that be of one world, but this one would have that relation to this middle which each has to its own; because there they have their influence, where and about where they wheel and turn. As, if several animals were pressed together and contiguous one to another, it would not therefore follow that the members of the one could belong to the members of the other, so that to one, and to each of them, could belong

several heads or torsos. But we, by the grace of the gods, are free from this trouble of begging such an excuse; because, instead of the place of so many heavens and so many rapid and reluctant mobiles — straight and oblique, eastern and western, on the axis of the world and the axis of the zodiac, in such and so much, in much and little declination — we have one sole heaven, one sole space, through which both this star in which we are, and all the others, make their proper circuits and courses. These are the infinite worlds, that is, the innumerable stars; that is the infinite space, that is, the heaven that contains them and is ranged through by them. The fantasy of the general conversion of all about this middle is removed by this, that we know openly the conversion of this [globe] which, turning about its own center, dispatches to the sight the surrounding lights in four-and-twenty hours. Whence is wholly removed that contenance of the deferent orbs bearing their stars fixed about our region; and there remains attributed to each only that proper motion which we call epicyclic, with its differences from the other mobile stars; while, agitated by no other mover than their own soul, they course — as this [globe does] about its own center and about the element of fire — for long ages, if not eternally. Behold, then, what the worlds are, and what the heaven is. The heaven is such as we see it about this globe, which no less than the others is a luminous and excellent star. The worlds are such as, with lucid and resplendent face, show themselves to us distinct, and set at certain intervals one from another; where in no part is the one nearer to the other than the moon can be to this earth, [or] these earths to this sun: to the end that the one contrary destroy not but nourish the other, and a like impede not but give place to a like. So, by reason and reason, by measure and measure, by times and times, this most cold globe, now from this side now from that, now with this face now with that, warms itself at the sun; and with a certain vicissitude now yields, now makes the neighboring earth (which we call the moon) yield to it, the one and the other making itself now farther from the sun, now nearer to it: for which it is called antichthon-earth by the Timaeus and other Pythagoreans. Now these are the worlds, inhabited and tilled all by their animals, besides that they themselves are the most principal and most divine animals of the universe; and each of them is no less composed of four elements than this in which we find ourselves; although in some one active quality

predominate, in others another; whence some are sensible by their waters, others sensible by their fire. Besides which four elements that come into the composition of these, there is an etheric region, as we have said, immense, in which the whole moves, lives, and vegetates. This is the ether that contains and penetrates everything; which, inasmuch as it is found within the composition (inasmuch, I say, as it becomes part of the composite), is commonly named air — such as is this vaporous [air] about the waters and within the terrestrial continent, enclosed among the highest mountains, capable of thick clouds and tempestuous south and north winds. But inasmuch as it is pure, and becomes not part of a composite, but place and container through which that [composite] moves and courses, it is properly named ether, which takes its denomination from running. This, although in substance it be the same with that which is agitated within the bowels of the earth, bears nonetheless another appellation; as, besides, that surrounding us is called air; but, inasmuch as in a certain manner it becomes part of us, or concurrent in our composition — found in the lung, in the arteries, and other cavities and pores — it is called spirit. The same, about a cold body, becomes concrete into vapor; and about a most hot star is rarefied, as into flame; which is not sensible save when joined to a thick body that comes to be kindled by the intense ardor of that [star]. So that the ether, as to itself and its proper nature, knows no determinate quality, but receives all [qualities] proffered by neighboring bodies, and the same, by its motion, transports to the length of the horizon of the efficacy of such active principles. Now behold shown you what the worlds are and what the heaven is; whence not only may you be resolved as to the present doubt, but also as to innumerable others; and so have a beginning to many true physical conclusions. And if till now some proposition shall seem supposed and not proved, that for the present I leave to your discretion; which, if it be without perturbation, before it come to discover it most true, will esteem it much more probable than the contrary.

ALB. Tell me, Theophilus, for I am listening.

PHIL. So we have resolved also the sixth argument, which, by the contact of worlds at a point, asks what can be found in those triangular spaces that be not of the nature of heaven nor of elements. For we have one heaven, in which the worlds have their spaces, regions, and fitting distances; and which diffuses

itself through all, penetrates all, and is container, contiguous, and continuous to all, and leaves no void; except if that same — as the site and place in which all moves, and the space in which all courses — it should please you to call void, as many have called it; or else first subject, that there be understood in it a void, so as not to make it have place in any part, if it pleased you privatively and logically to posit it as a thing distinct by reason, and not by nature and subsistence, from being and body. So that nothing is understood to be which is not in place, either finite or infinite, either corporeally or incorporeally, either according to the whole or according to the parts; which place at last be nothing other than space; which space be nothing other than void; which [void], if we will understand it as a persistent thing, we say to be the etheric field that contains the worlds; if we will conceive it as a subsistent thing, we say to be the space in which is the etheric field and the worlds, and which cannot be understood to be in another. Behold how we have no necessity to feign new elements and worlds, contrary to those who, for the lightest occasion, began to name deferent orbs, divine matters, rarer and denser parts of celestial nature, quintessences, and other fantasies and names void of all subject and truth.

To the seventh argument we say that the universe is one infinite, as a continuum composed of etheric regions and worlds; and that the worlds are infinite, which in diverse regions of that [universe] must by the same reason be understood and be, as this in which we dwell — this space and region — understands and is: as in the nearest days I have reasoned with Elpino, approving and confirming that which Democritus, Epicurus, and many others said, who with eyes more open have contemplated nature, and have not presented themselves deaf to her importunate voices.⁶

Desine quapropter, novitate exterritus ipsa,
Expuere ex animo rationem: sed magis acri
Iudicio perpende, et si tibi vera videtur,
Dede manus; aut si falsa est, accingere contra.
Quaerit enim rationem animus, cum summa loci sit
Infinita foris haec extra moenia mundi;
Quid sit ibi porro, quo prospicere usque velit mens,
Atque animi tractus liber quo pervolet ipse.
Principio nobis in cunctas undique partes,

Et latere ex utroque, infra supraque per omne,
Nulla est finis, uti docui, res ipsaque per se
Vociferatur, et elucet natura profundi.

It cries out against the eighth argument, which would have nature stop short in a compendium; because, although we experience [worlds] in each, great and small, it is not however seen in all; for the eye of our sense, without seeing an end, is overcome by the immense space that presents itself, and comes to be confounded and surpassed by the number of stars that ever more and more multiplies; so that it leaves the sense undetermined, and constrains reason ever to add space to space, region to region, world to world.⁷

Nulla iam pacto verisimile esse putandumst,
Undique cum vorsum spacium vacet infinitum,
Seminique innumero numero, summaque profunda
Multimodis volitent aeterno percita motu,
Hunc unum terrarum orbem, caelumque creatum.
Quare etiam atque etiam tales fateare necesse est,
Esse alios alibi congressus materiei:
Qualis hic est avido complexu quem tenet aether.

It murmurs against the ninth argument, which supposes (and proves not) that infinite active potency is not answered by infinite passive potency, and that infinite matter cannot be subject and become an infinite spacious field; and consequently that the act and action cannot be proportioned to the agent, and the agent can communicate all the act, without there being possible all the act communicated — than which no more open contradiction can be imagined. It is, then, well enough said:⁸

Praeterea cum materies est multa parata,
Cum locus est praesto, nec res nec causa moratur
Ulla, geri debent nimirum et confieri res.
Nunc ex seminibus si tanta est copia quantam
Enumerare aetas animantium non queat omnis,
Visque eadem et natura manet, quae semina rerum
Coniicere in loca quaeque queat, simili ratione

Atque huc sunt coniecta: necesse est confiteare
Esse alios aliis terrarum in partibus orbes,
Et varias hominum genteis, et secla ferarum.

We say to the other argument, that there is no need of this good, civil, and such-like commerce of diverse worlds, any more than that all men be one man, all animals be one animal. I leave that by experience we see it to be for the better of the living things of this world that nature has, by seas and mountains, distinguished the generations; to which, commerce having befallen by human artifice, there has not for that been added to them a thing of good rather than taken away, seeing that by communication vices are sooner doubled than virtues can take increase. So the Tragedian well laments:⁹

Bene dissepti foedera mundi
Traxit in unum Thessala pinus
Iussitque pati verbera pontum,
Partemque metus fieri nostri
Mare sepostum.

To the tenth it is answered as to the fifth; because thus each of the worlds in the etheric field obtains its space, so that the one touches not nor jostles with the other; but they course and are situated with such distance whereby the one contrary destroys not, but is fomented by, the other. To the eleventh, which would have nature — multiplied by the decision and division of matter — put into such act only by way of generation, while one individual as parent produces the other as offspring; we say that this is not universally true, because from one mass, by the work of the sun as efficient, are produced many and diverse vessels of various forms and figures innumerable. I leave that, if there be the destruction and renewal of some world, the production of animals, as well perfect as imperfect, is at the beginning effected without act of generation, by the force and virtue of nature. To the twelfth and last, which from this, that this or another world is perfect, would have it that other worlds are not required, I say that certainly they are not required for the perfection and subsistence of that world; but for the proper subsistence and perfection of the universe it is necessary that they be infinite. From the perfection, then, of

this or those, it does not follow that those or this be less perfect: because as well this as those, and those as this, consist of their parts, and are, by their members, whole.

ALB. Now I see, Filoteo, that you have not, like some rash captain, taken upon you to hold a fortress whose approaches you had not first surveyed; for there is no quarter from which the adverse opinion might assail us that you have not already weighed and made good. These twelve reasons, which I had esteemed the very sinews of the contrary cause, I find not so much answered as dissolved — and dissolved at the root, so that, the foundation once drawn away, the whole fabric falls of itself.

PHIL. You apprehend it rightly; for error, no less than truth, hangs together in a chain, and he who unlooses the first knot unbinds the rest.

Alb. I confess it freely, nor am I ashamed to confess it. I was called to you as a physician is called to one distempered, thinking to feel your pulse and inspect your water; and behold, it was I who lay sick, and you who have made me whole. That which I held most certain I now hold most doubtful; and that which I derided as a fable I begin to embrace as the very countenance of nature. I feel the roots of one philosophy plucked up within me, and the roots of another set in their room.

PHIL. Take heed only that you receive not a new credulity in the place of an old; but, having weighed the one and the other contradictory as equally possible, that you yield to that which reason, sense, and nature do together approve. For I would not have you my disciple, but a disciple of the truth.

ALB. So do I purpose. And since I now perceive how a small error in the beginning grows, little by little, into a monstrous falsehood in the end — and how, on the contrary, one truth discovered opens the gate unto another — I will no longer suffer the authority of the multitude, nor the frown of the schools, nor the venom of the envious, to hold my judgement in bondage. Proceed, therefore, and proceed boldly; spare not the idols, how reverend soever they appear; and let neither the vulgar, who understand nothing, nor the proud, who will understand nothing, nor those unhappy spirits whom envy gnaws, draw you back from so worthy an enterprise: to the end that, by the light of such contemplation, we may proceed with surer steps unto the

knowledge of nature.¹⁰

Notes

1. "Nowhere, then, will the world be; the whole will be in nothing."
2. Lucretius, *On the Nature of Things* I. "For surely, if all the space that is were established as finite, and a man ran out to its utmost edge and hurled a flying dart, would you have it that, thrown with strong force, it goes whither it was sent and flies far; or do you judge that something can hinder it and stand in the way? For either there is something that hinders it and keeps it from reaching whither it was sent and lodging at the end, or it is carried onward — in which case, in truth, it did not set out from any end at all."
3. Lucretius, *On the Nature of Things* I. "For before our eyes one thing is seen to bound another: air walls off the hills, and mountains the air; earth bounds the sea, and the sea in turn bounds all lands; yet the whole — there is nothing outside it to bound it. So vast on every side lies open the immense abundance of things, the bounds removed, on all sides everywhere."
4. Love (Cupid), proverbially blind to those who themselves see nothing.
5. Apollo, slayer of the serpent Python; the "Fury" is Megaera.
6. Lucretius, *On the Nature of Things* I: "Cease, therefore, terrified by the very newness, to spit reason out of your mind; but rather weigh it with keen judgment, and, if it seem true to you, yield; or, if it be false, gird yourself against it. For the mind seeks a reason, since the sum of space is infinite out beyond the walls of this world: what may be there further off, whither the mind ever wishes to look forward, and whither the free reach of the spirit may fly of itself. First, on every side, in all directions, on both flanks, below and above, throughout the whole, there is no end, as I have taught; and the thing itself proclaims it of itself, and the nature of the deep shines clear."
7. Lucretius II: "In no way is it now to be thought likely, when on every side empty infinite space lies open, and seeds in number numberless, in unfathomed sums, fly in manifold ways stirred by everlasting motion, that this one orb of earth and heaven alone was made. Wherefore again and again you must confess that there are elsewhere other gatherings of matter, such as this is which the aether holds in its greedy embrace."
8. Lucretius II: "Besides, when much matter stands ready, when place is at hand, and neither thing nor cause delays, then surely things must be carried on and brought to pass. Now if there is so great a store of seeds as the whole age of living things could not number, and the same force and nature abide which could cast the seeds of things

together into their several places in like manner as they were cast together here, then you must confess that there are in other parts of space other worlds, and varied races of men and generations of wild beasts.”

9. Seneca, *Medea*: “The Thessalian pine drew into one the well-sundered covenants of the world, and bade the deep suffer the lash, and the sea set apart become a portion of our fear.”

10. So the dialogue closes in Bruno’s Italian: «a fine che con il lume di tal contemplazione con più sicuri passi procediamo alla cognizion della natura». These are the last words of the work.