Paradiso 2

FIXME: ~~This lecture was first given in the week of a new moon. Then, I implored my audience to bear my words in mind as they watched it getting rounder and rounder; becoming both brighter, as more and more of its surface are illuminated by the sun, but also darker, as more and more of the 'craters' and 'seas' are exposed, until they began to see why people used to tell stories about a 'Man in the Moon'. It was then the twenty-fifth anniversary of when man first set foot on the moon, a time marked by copious press coverage, and pieces concerning attempts to discover whether there is 'intelligent life' elsewhere in the universe.~~

These things were mentioned for a specific purpose: in order to challenge the commonly held view that Dante's Paradiso is necessarily more 'remote' from us than his Inferno. For the facts of the matter are that there is no Hell underneath the earth, that it will never be possible to make a 'Journey to the Centre of the Earth', and that very few of us believe literally in the existence of Satan or in eternal punishments after death. Whereas, the action of the first 29 cantos of the Paradiso describes an interplanetary space flight on which the first staging post will be the moon, which you can see with your naked eye on most evenings, and where we know that it is possible for a man to land.

The canto that is our topic touches on themes relevant to us, such as the curvature of space, the relation of mind and matter, the nature of knowledge, and, especially, the relationship between experimentation and abstract thought in science, and comes to the conclusion that there is indeed 'intelligent life' in the planets and stars, or, at least, that they are 'regulated' by intelligent beings.

For reasons of time, I am not going to say anything about the opening 18 lines, and next to nothing about the space flight which has been carrying Dante and Beatrice upwards from the summit of Mount Purgatory through the sphere of Fire, with no other propellent than the 'concreated and perpetual thirst of the godlike kingdom'.

Figure 1: (P_Pa2_1) Illumination of Dante and Beatrice's flight

We shall pick the story up at line 25, where Dante realises that he has come to a halt, because an amazing or awe-inspiring phenomenon ('mirabile cosa') draws his eyes towards it, and therefore away from Beatrice. She, however, reads his thoughts, and reassures him by telling him that God has 'conjoined' them with the 'first of the stars', which, in the geocentric system was, of course, the moon.

'Meraviglia' is normally dispelled by the discovery or the explanation of the causes of the strange new phenomenon that produced the emotion; but in this case the explanation should intensify our sense of astonishment. To the protagonist it seemed as if he and Beatrice had been 'covered' by a cloud—except that, contrary to the experience of hill walkers, the cloud is 'solid' and is shining like a diamond glittering in the sun. The author explains (I stress the author, because the second terzina shows the advantage of hindsight) that they had penetrated the body of the 'eternal pearl'—a lovely metaphor for the moon—as effortlessly as a ray of light penetrates water, without splitting, displacing, or otherwise changing the 'pearl' (which if it were capable of change, would not be 'eternal').

At this point you might say: 'Wait a moment!' Dante had emphasised in the first canto that he himself was there 'in the body', in flesh and blood. The moon is solid and dense, and is therefore a body. A body ('corpo'), by definition, occupies three dimensions, and therefore occupies space. And as Aristotle had proved in his *Physics*, which is the science of 'bodies' in nature or of 'natural bodies', it is impossible for two bodies to be in the same place at the same time. So Dante interrupts the narrative, which he has only just begun, in order to congratulate you on your 'puzzlement', and to offer some clarification.

Yes, he was in the body; yes, he does know that a body has 'dimensions'; yes, he does mean that the two bodies were in the same place; yes, he does know that one dimension cannot 'suffer' another, because they are not 'compatible'. What he is here describing is not simply 'marvellous'—that is to say, strange and as yet unexplained but, in principle, explicable. Rather, it is miraculous—that is, explicable only on the assumption that God has intervened directly, and that the laws of natural causation have been suspended.

In these nine lines (19–27), Dante seizes the opportunity to allude to a whole series of interlocking propositions about the human intellect and its different 'ways' of arriving at the truth; and these propositions form the 'ground base', so to speak, of innumerable 'variations' in the rest of the poem. So it will be worth our while to spell them out. Briefly put, human understanding begins in the senses, especially in the sense of sight ('vedere'), when a strange phenomenon ('mirabile cosa') excites the emotion of 'meraviglia', or 'maraviglia', also called 'ammirazione'. It involves an element of direct intuition, though limited to the so-called 'first truths', or first principles, such as the self-evident axiom ('per sé noto') that a whole is greater than one of its parts.

Most characteristically, however, the act of understanding is the result of a laborious process of discursive reasoning—step by step deductions from these first principles or from earlier conclusions, as when we 'prove' a geometrical theorem (which is what is meant by 'demonstration' in line 44). In the study of theology, the process begins in an acceptance on trust, or by faith, of truths concerning God that human reason could never 'demonstrate'—for example, that Jesus Christ was fully

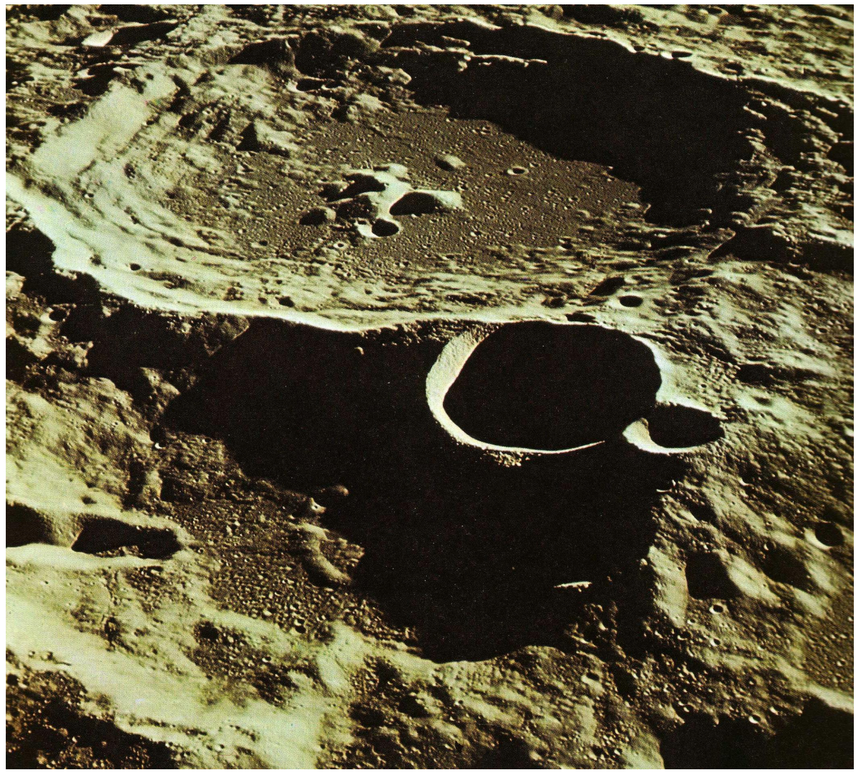

Figure 2: (P_Pa2_2) Photograph of craters of the moon, and map of the lunar terrain

They are laid out irregularly, as you can see from the map, but there is a marked concentration to the north, with downward extensions to the west and in two 'lobes' to the east. You will remember that the moon always shows us the same face, which is to say that the distribution of the seas is readily visible to the naked eye, and if we were to draw what we see, it would look much like the chart in fig. 2b.

Medieval observers, however, were more fanciful. Jean de Meun, the author of the second part of the *Romance of the Rose* who was writing in the 1270s (about 40 years before Dante) said that people thought they could see a 'marvellous beast', comprising a serpent, with a tree on his back, and, on the tree, a man:

> Et la part de la lune occure
> nous represante la figure
> d'une trop merveilleuse beste:
> c'est d'un sarpent qui tient sa teste
> vers occident adés ancline,
> vers oriant sa queue affine;
> seur son dos porte un arbre estant,
> ses rains vers oriant etant,
> mes en estandant les bestourne;
> seur ce bestourneïz sejourne
> uns hon sus ses braz apuiez,
> qui vers occidant a ruiez
> ses piez et ses quisses andeus,
> si conme pert au semblant d'eus.
> (*Le roman de la rose*, 16851–64)

One of the illustrators to our canto (the same 14th-century artist whose brilliant representation of space flight we saw earlier) shows us a leaning man, with the tree—the 'thorn bush' of which Shakespeare speaks—apparently growing out of his [** OR its; CHECK back. (Or perhaps he may be showing a serpent, tree and a man, as stated in the *Romance of the Rose*.)

Beatrice smiles at Dante's question about the dark marks, which to her illustrates the frailty of human reasoning even when it has reliable sense-data as its point of departure. (Lines 52–57 are a development of some of the themes of Dante's authorial meditation earlier in the canto). Then (58), like a skilled teacher, she asks her pupil for his personal opinion: 'quel che tu da te ne pensi'.

There are three points to notice about the protagonist's very brief reply (59–60). First, he generalises his answer (and therefore the scope of his original question) so that it includes all variations, all diversity in the celestial regions ('qua sù' meaning 'up here'). Second, the answer he gives was a highly respectable one, which had the authority of scholars like Albert the Great; it had been adopted by Jean de Meun, and also been accepted by Dante himself at the time of writing his *Convivio.* In his prose work, he had explained the underlying reasoning:

> L'una si è l'ombra che è in essa, la quale non è altro che raritade del suo corpo, a la quale non possono terminare li raggi del sole e ripercuotersi così come ne l'altre parti.*

(*Convivio* II, xiii, 9)

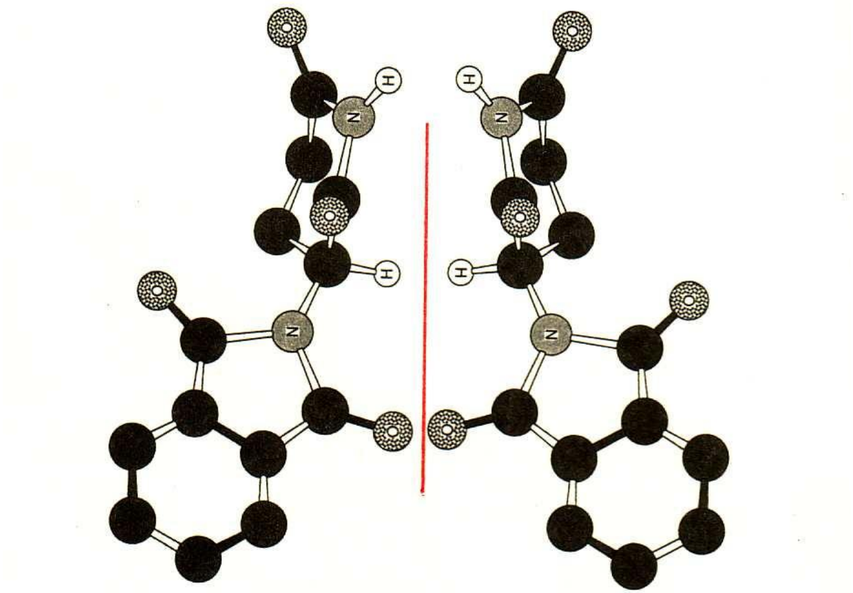

Figure 3: (P_Pa2_3) The enantiomers of (RS)-2-(2,6-dioxopiperidin-3-yl)-1H-isoindole-1,3(2H)-dione

It is the molecule of the drug thalidomide. Studies have suggested that it was the right-handed molecule which acted as a sedative, but was otherwise innocuous, while the left-handed molecule turned out to have appalling effects on the unborn child[a]. Different forms, different properties, different effects.

With these ideas in mind, let us return to our canto (61). Beatrice accepts Dante's generalisation of the question by applying his argument to the eighth sphere, the one with 'molti lumi'—that is, the stars in their constellations—which are self-evidently different in size ('nel quanto') and in their properties ('nel quale'). (Here, you must remember that Dante's contemporaries would have accepted that the effects of Capricorn and Cancer on man were as self-evidently different as those of an acid and an alkali on litmus paper). Such effects, Beatrice continues, are produced by active powers—'virtues' (68, 70). These are inherent in the structure or form (70–71); and different powers point to different forms, or formal principles. If Dante were correct, if all diversity were due to 'raro e denso' (67), this would imply that all the stars, and indeed all the planetary heavens, would produce the same effects, because they all had the same formal principle. The falseness of the consequence demonstrates the falseness of the assumption.

This is followed by a separate line of argument (73ff), which is limited to the moon. If Dante and Jean de Meun were right, and if the dark patches ('bruno', 73) correspond to areas of low density ('raro'), then it is theoretically possible (as Jean specifically said) that the pockets of low density extend all the way through the moon to the other side ('oltre in parte', 74). On this hypothesis, the sun's rays would simply travel through the moon exactly as they do through transparent glass (and, again, Jean had specified 'verre transparent'). But if this were really the case, it would become evident during an eclipse of the sun (80), when the moon passes between the earth and the sun, because the sun's rays would shine through from the rear to the front. This does not happen ('questo non è', 80, 82)—as you too may confirm from this photograph of a total eclipse:

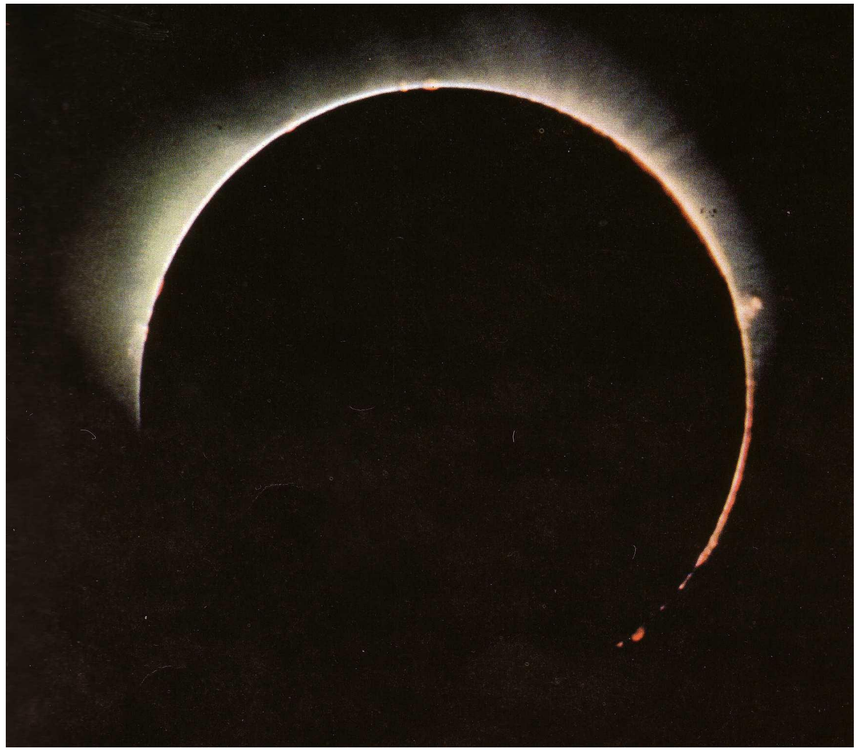

Figure 4: (P_Pa2_4) A solar eclipse

[a]** I NEED TO THINK, AT A LATER STAGE, WHAT KIND OF NOTE WOULD BE APPROPRIATE HERE. ~~More recent studies have also shown that, even when one form is isolated and administered alone, the human body may transform one enantiomer into the other *in vivo*, meaning its harmful effects cannot be avoided by separation.~~

So the theory expounded in the *Romance of the Rose* has been 'broken', and shown to be 'false', as Beatrice says in line 84. The other possibility, referred to in lines 76–78, is that the areas of high and low density—*rarum et densum*—are distributed in layers, like the fat and the lean in animal flesh. But in this case, says Beatrice, there must be a 'termine' (86) formed by a layer of denser matter sealing off a pocket of rarefied matter (which is its 'contrario', 87). Hence the sun's rays would still be reflected 'from this point', (88), 'indi', and thus the area in question would be no less bright than those others where the surface itself was 'solida e pulita'.

On this hypothesis, in fact, the moon would be exactly like a mirror, as described by Jean de Meun. The rays of colour (or of coloured light, as we should say) which emanate from my face, are invisible in the atmosphere and still invisible (or only faintly visible) if I cut them off with piece of clear glass. But if that glass were to be coated with lead ('piombo', 90) on the rear surface ('retro', 90), the coloured rays, or the colour (89), would return from the hidden metal, so that I could see my face in order to help me shave. Dante the character may, however, be hampered by one last 'objection' ('instanza', 94): perhaps the affected area is 'dark' ('tetro', 91) precisely because it is reflected from further back ('refratto più a retro', 93); and everyone knows that light gets fainter the further it is removed from its source.

However, Beatrice promises to make short work of this objection through the 'experience' of the senses ('esperienza', 95), or, as we would say, through an 'experiment', which she goes on to describe. (Note too, in these two lines, that knowledge begins with 'experiment' or 'experience' in Aristotelian science, no less than in modern science.)

The experiment involves not just one mirror but three, and requires the fairly careful placing of a flame. I have taken the trouble of following Beatrice's instructions, and photographed the results, so that you may judge the matter for yourself. Any Fellow of my college in Cambridge (St John's) who reads about reflections and candles will immediately think of our Combination Room, which is a typical Tudor Long Gallery, where we dine during the vacations amid a gleam of polished wood and silver. It is a room—to quote a line later in this canto—that 'many lights make beautiful' ('cui molti lumi fanno bello'):

Figure 5: (P_Pa2_5) The Combination Room, scene of the experiment

I was delighted to find, in the circumstances, that the long exposure required to make the slide (fig. 5) transformed all the candles into stars.

Passing to the far end of the room, I followed the very clear instructions given in Dante's text. I set out three mirrors of equal size, arranging them so that two were equidistant from my position (which was outside and to the right of the image in fig. 6), while the third mirror lay at a greater distance between the other two:

Figure 6: (P_Pa2_6) The three mirrors

All three mirrors were angled so that I could see myself in each of them. Behind me, I put a lighted candlestick, exactly as you see in this 15th-century diagram illustrating our canto:

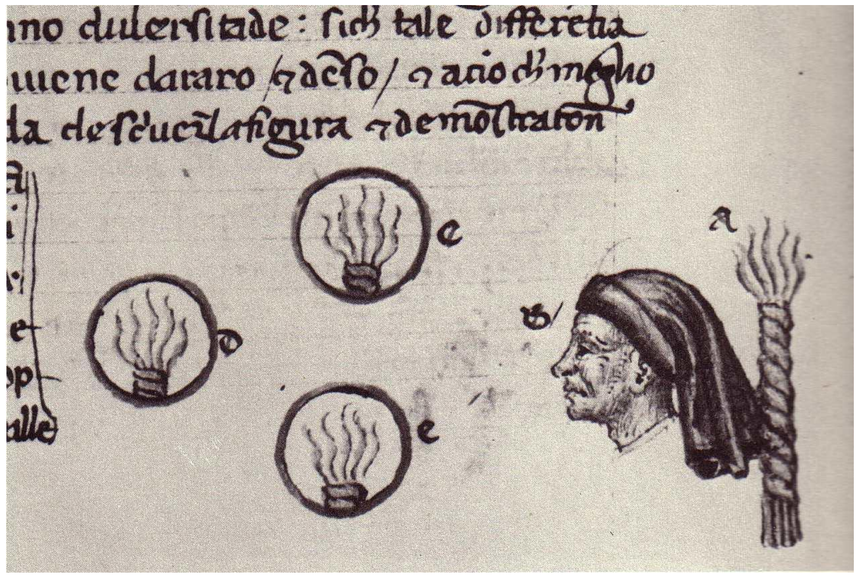

Figure 7: (P_Pa2_7) Fifteenth-century diagram explaining the experiment

I then looked at the three reflected images of the candle and considered their size and brightness—their ‘quanto’ and their ‘quale’.

As to the ‘quanto’, it was obvious that the distant image was smaller than the other two (the fifteenth-century diagram is wrong in that very crucial point). With regard to the brightness, the ‘quale’, however, you may judge for yourselves:

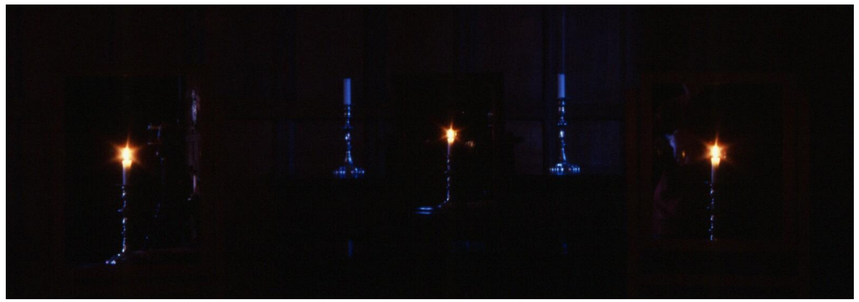

Figure 8: (P_Pa2_8) Three photographs of Beatrice’s experiment

I put a camera where my head had been and took three exposures, the first (top) at 32 seconds, to show the mirrors and the gleam of the candles on the silver, the next (middle) at 8 seconds, and the third (bottom) at 2 seconds. For myself, I am reasonably happy that Beatrice has a fair point. To the unprejudiced eye, the middle reflection does look about as bright as the outlying reflections, whether at 2 seconds, at 8 seconds, or at 32 seconds (where the 'star-effect' which is so appropriate to our canto becomes very pronounced).

Now that you have seen the experiment for yourselves, let me translate Dante's description of it as literally as I can, so that you can enjoy the marvellous concision and clarity of the language that Dante took over from medieval science:

> You shall take three mirrors
> and remove two of them from you in one way,
> and let the other, further removed,
> find your eyes between the other two.
> Turning towards them,
> see to it that behind your back there stands a light,
> which illuminates the three mirrors
> and comes back to you reflected from them all.
> Although in magnitude
> the more distant image does not extend so far,
> you will see that it must shine out equally.
> (*Paradiso* 2, 97–105)

Alas, I shall have to deny you my thoughts on the splendid simile (106–111) which marks the moment of transition from refutation to assertion, from weeding out to planting anew, and from a relatively plain and restrained style to some of the most beautiful and evocative poetry that Dante ever wrote. This is because the last 37 lines of our canto are conceptually quite difficult, and I need the time to give you the necessary introduction.

Let me resume by reminding you that Dante and Beatrice are now inside the moon, and that the subject under discussion is the 'dark signs' on the surface, considered as part of the general problem as to what causes diversity in the celestial regions. The conclusion to be reached is simply a restatement of the Aristotelian axioms that we met in the first part of the refutation, although this time the emphasis is reversed. A brief glance at the last lines of the canto will show us the direction in which we are heading:

> Virtù diversa fa diversa lega
> col prezioso corpo ch'ella avviva,
> …
> Da essa vien ciò che da luce a luce
> par differente, non da denso e raro;
> essa è formal principio che produce,
> conforme a sua bontà, lo turbo e 'l chiaro».
> (*Paradiso* 2, 139–148)

The differences between dark and light (148), or between star and star (145), are caused by different 'virtues' (139), different powers; and these are the consequences of different structures, different 'formal principles' (147), and not of density or

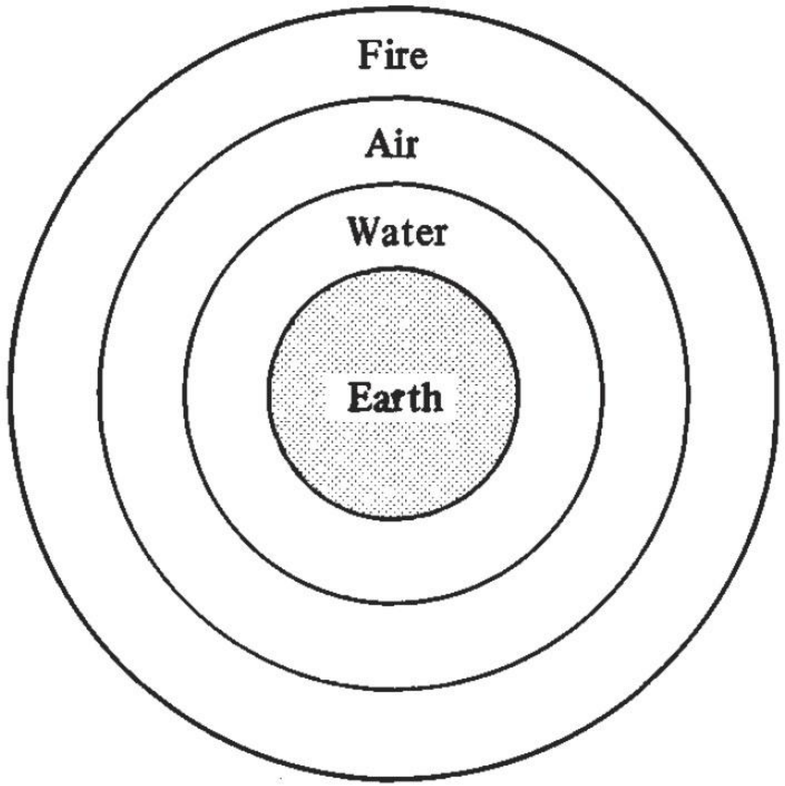

Figure 9: (P_Pa2_9) The four elements of Dante's universe

The core consists of the motionless sphere of Earth. This is surrounded by the other three elements, which would always have remained in their separate spheres (thanks to the difference in weight or lightness) if they had not been 'mixed' by an external agent (Dante will elsewhere say by the stars). Or, to put it more precisely, Water, Air and Fire would have remained separate, if all four elements had not been brought into contact, on or near the surface of our globe, in order to enter into the many compounds that underly plant and animal life.

Around these four spheres, arranged like the skin of an onion, are eight further spheres composed of a fifth element called aether. The first seven of these carry one planet each, while the eighth has many constellations:

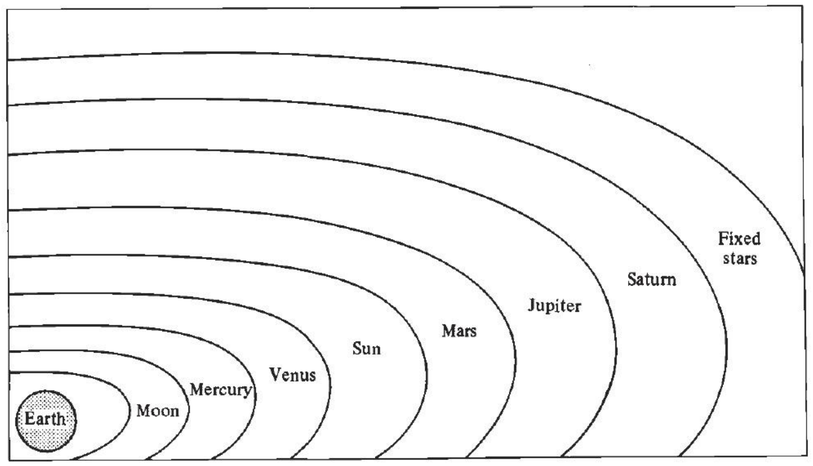

Figure 10: (P_Pa2_10) The eight further spheres

Each of these eight spheres—here reduced to two dimensions—has the power of self-movement from west to east (or, rather, of movement on an inclined plane from south-west to north-east) in periods which range from one complete revolution in 29 ½ days (in the case of the innermost heaven) to one degree in a hundred years in the case of the eighth.

Outside these, there is a ninth sphere, also composed of aether, which has no 'luminaries', and which is perfectly uniform. It, too, is capable of self-movement. It revolves in the other direction, east to west, about the vertical axis, completing one revolution in just short of 24 hours; and—crucially important—it sweeps all the inner heavens around with it, which is why the sun goes from east to west every day. This heaven is called the 'first moving thing' ('primum mobile'), and it is the containing body. Everything else is located within it, while it is contained or located only in God's mind, or 'in God', or, to put it another way, in a 'heaven' beyond space and time called the 'Empyrean', eternally still, which Dante will call the 'heaven of divine peace'.

These are the ideas that Dante will transform into great poetry in lines 112–14:

> Dentro dal ciel de la divina pace
> si gira un corpo ne la cui virtute
> l'esser di tutto suo contento giace.
> (*Paradiso* 2, 112–14)

There simply is not time to explain at length how Dante conceived the so-called 'influences' or 'impressions' raining down to earth from the planets and stars; however, it is important to know that it was generally assumed that each planet, or each constellation, did cause effects analogous to those which we still attribute to the sun. This influence was carried in the rays of light; and the movements of the heavens brought these different influences to all parts of the earth every day (thanks to the primum mobile), but in ever different combinations and altitudes (thanks to the proper movements of the inner heavens on their inclined plane). This is what Dante means in line 127 by 'lo moto e la virtù d'i santi giri'.

Having summarised these facts, we may return to the text. In the first four terzinas of this final section, Beatrice describes the order of the heavens (proceeding from the outside towards the centre). She indicates the Empyrean (112), the primum mobile (113–14), the heaven of the stars (114–17), and the seven planetary spheres, considered as one group (118–20). She ends by insisting (121–3) that all the physical heavens (including the primum mobile) are collectively 'instruments' or 'tools' ('organi') of the universal system, which produce their effects in the world below, but receive their 'programme' and their 'energy' from above—and ultimately, therefore, from God.

Simultaneously, however, and especially in lines 116–19, Beatrice is insisting on the increasing 'diversification' or 'differentiation' which is the true subject of her discourse. At each stage of the 'descent'—of the 'journey' from the circumference to the centre—the gift of being as such is 'resolved', 'divided', 'distributed' or 'distracted' into distinct kinds or species, and, finally, into individual bodies. (The crucial words are 'parte', 'distratto', 'differenze', 'distinzioni').

This brings us to lines 127–148, which for me, personally, are the most fascinating and challenging in the whole canto—where Beatrice approaches the question of