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Modern astronomy and our perception of the universe

The change in our perception of the cosmos introduced by modern astronomy, starting with Copernicus, Galileo and Kepler, has had wideranging repercussions on the human worldview, both secular and religious. The immensity of the universe and the apparent bleakness of outer space produce possible problems for faith; these are examined, and solutions are proposed.

Keywords: astronomy, universe, God, Milton, Pascal, Nietzsche, space.

In this article I examine some of the issues arising out of astronomy which affect our view of the human place in the universe, with special regard to the way in which our relationship with God is perceived. Probably few of the points raised here are new; however, these questions merit a continued consideration. This is not intended to be an exposition or critique of modern astronomy, still less of cosmological theories. Rather, it is intended to address certain obstacles to religious belief for which the modern scientific viewpoint appears to be responsible.

The medieval picture of the universe

It is often alleged that people in the Middle Ages believed in a flat earth. While this may have been true at some level with the uneducated populace (whose beliefs on such subjects are rather hard to determine), it is a fallacy of the first order with regard to the educated people of the time, and with regard to the Church in particular. During the Middle Ages in western Europe, views based on the teachings of Aristotle and Ptolemy were mainly held.[1] In these systems, the earth was a stationary sphere at the centre of the universe, with the sun, moon, planets and stars attached to invisible celestial spheres that revolved around it at various distances and speeds. Circular motion was originally assumed for the heavenly bodies on the grounds that the circle is the most perfect of geometric figures and the heavens are the realm of perfection. But since simple circles do not give agreement with the observations, Ptolemy and his later followers employed secondary geometric constructions known as equants and epicycles, making the system inelegantly complicated. In all this the earth was taken as spherical, during the medieval period as in the Classical. Only a handful of voices in the Church, and

1 For a classic account see J. L. E. Dreyer, *A History of Astronomy from Thales to Kepler*, 2nd ed., New York: Dover (1953). I should like to thank the journal referees for some helpful comments on this section.

minor ones at that, are ever recorded as advocating a flat earth.

The historian Jeffrey Burton Russell has related how the idea of a medieval belief in a flat earth should be seen as later 'misinformation'.[2] The notion was invented in the nineteenth century by a number of writers whose feelings of enlightened superiority led them to disparage anything medieval as steeped in deepest superstition and ignorance. Such was the spirit of the period, particularly in America, that these views found a ready audience, and eventually became common schooltext teaching. It is one of the ironies of intellectual history that the actual credulity here was to be found in those who were berating its alleged presence in others.

The medieval picture of the universe was, of course, still very different from our own. Heaven was spatially located in the region outside the planets and stars, while hell lay somewhere under the earth's surface. Popular artistic depictions – for example in church wall-paintings – make the universe appear rather small and cosy. However it was realised by Ptolemy and the later scholars that by earthly measures, the universe was large.[1,3] The sphere of the fixed stars, usually placed not a long way outside that of Saturn, had an estimated radius of around fifty to one hundred million of our miles. Such a scale is known now to be far too small, but to the imaginations of the time it was enormous.[4] The educated medieval picture, therefore, was of a universe that was large but finite. (At the end of the sixteenth century Giordano Bruno disturbed some of his contemporaries by teaching that the universe is infinite. However a number of later scholars responded that an infinite God could create an infinite universe.)

The Renaissance revolution

The beginnings of modern astronomy may be conveniently dated from Galileo's first telescope observations in 1610, with consequences that I believe the human mind has still not fully digested. To remind the reader: by means of his newly developed telescope, Galileo succeeded among other things in discovering the craters on the moon, sunspots, the moons of Jupiter and the phases of Venus. Copernicus had earlier proposed that the earth moves round the sun, and not vice versa, and Galileo argued for this point of view. Kepler provided further support by showing that the observed positions of the planets in the sky agreed better with a system of elliptical orbits around the sun than with circle-based constructions around the earth. It was from now on a 'solar' system. All this amounted to a revolution in astronomical science, and set in motion a demythologising of people's concepts of the heavens. Heavenly bodies became seen to be ordinary physical objects just as the earth is. 'Heavenly perfection' was gone.

2 J.B. Russell, *Inventing the Flat Earth: Columbus and Modern Historians*, Westport CT: Praeger (1997).
3 A. Van Helden, *Measuring the Universe*, Chicago: Univ. of Chicago Press, (1985).
4 C.S. Lewis, *The Discarded Image*, Cambridge: Cambridge Univ. Press (1964) ch. 5. This book gives a description of many varied aspects of medieval thought.

What was in the process of emerging during the seventeenth century was a new way of thinking, accompanied by an increased concern with education. In a sense, Europe was becoming more intellectual. Medieval Europe certainly had its intellectual life, of course, but the vast majority of people remained outside this. An illiterate peasantry needed its faith to be presented in uncomplicated and pictorial terms, such as the familiar wall-paintings with Heaven high above the earth, hell in sulphurous caverns beneath. More educated minds were aware of the large size of the universe and the earth's sphericity, but could still combine Ptolemy's cosmology with the Church's teachings. The new scientific approach changed all this for ever.

The most important issue, however, was not at heart intellectual. The medieval worldview assisted believers to relate in a personal way to certain truths of their religious faith, and to feel a sense of the presence of spiritual realities. If you believe that the earth is related in a simple, *spatial* way to heaven – where God dwells – so that the heavenly realm actually surrounds the earthly at a great height, then several helpful consequences follow. The presence of God is felt more clearly: the human being can visualise how, dwelling in heaven, He is able to look down on all that goes on on earth. We say, 'There's One Above who sees!' Moreover we are *literally* within God's domain. Since Heaven encompasses the universe we are, without metaphor or analogy, living inside the Realm of God. The problems and difficulties of life on earth are because the earth's surface is the boundary, and hence the battleground, between the heavenly forces above, and the subterranean forces of hell. Again the physical picture reinforces the spiritual teachings.

With the abandonment of literal pictures such as this, there occurs a curious inversion of viewpoint. Instead of a human being having a sense of dwelling inside deepest Reality, deepest Reality now seems to dwell only within the human being. The trouble is that now, without the concrete physical picture, our faith may seem to have its basis and life in our own minds and intellects alone; spirituality has become an 'internalised' thing. Is this sufficient? These and related themes will be the subject of our discussion in the following sections.

Some reactions

Among intellectual circles in the seventeenth century, the new discoveries generated considerable interest which was reflected in the literature of the time.[5] At least among protestants, the new knowledge made for an increased awareness of the heavens' magnificence, and was often viewed positively from both a human and a religious point of view. The poet Milton wrote that the Milky Way was a 'broad and ample road whose dust is gold and pavement stars'. Dryden had no theological problem with a more elaborate universe:

5 I have made considerable use here of the account given by M. Nicolson in *Science and the Imagination*, Ithaca NY: Cornell Univ. Press (1956).

Perhaps a thousand other worlds that lie
Remote from us, and latent in the sky,
Are lightened by [God's] beams, and kindly nurs'd.[6]

But other currents of thought were also emerging, early on in John Donne (in 1611!)[7]:

And new Philosophy calls all in doubt,
The Element of fire is quite put out;
The Sun is lost, and th'earth and no man's wit
Can well direct him where to look for it.
. . .
'Tis all in peeces, all cohaerence gone . . .

These are themselves slightly incoherent reactions, but the poet clearly feels more than a little lost himself with the new science. William Drummond commented, following Donne's poem, that the sciences were leaving the imagination 'in a thousand labyrinths'.[8]

Milton wrote his *Paradise Lost* as a cosmic Epic on the grandest scale, and borrowed from the new astronomical vision. Astronomical references and images abound, and may even be seen in the description of primeval Chaos as

. . . the hoary Deep – a dark
Illimitable ocean, without bound,
Without dimension; where length, breadth, and highth,
And time, and place, are lost.
. . . the vast immeasurable Abyss,
Outrageous as a sea, dark, wasteful, wild . . . [9]

The primeval Deep in the Bible is indeed like a sea, but now space too is unfathomable as the ocean (we talk about the 'depths' of space) and cosmic and marine imagery seem to overlap. Space and the ocean depths are both *dark*. The sea, however, possesses a creative potential which may be absent from space. Milton's Hell is guarded by a 'void profound of unessential Night', to be feared by any fallen angel since it is 'Wide gaping, and with utter loss of being Threat'ns him'.[10]

Milton's religious faith found no difficulty with the new astronomy; God is present in His own realms and in the universe too:

Boundless the Deep, because I am who fill
Infinitude; nor vacuous the space . . . [11]

6 *Eleanora*, II, 76–9.
7 *First Anniversarie*, II, 257–262.
8 *Cypress Grove* (1623).
9 *Paradise Lost*, 2, 890ff; 7, 211f.
10 Ibid., 2, 438ff.
11 Ibid., 7, 168f. Nicolson emphasizes that to Milton, 'infinitude' actually refers to God not space.

Extended passages in *Paradise Lost* give glory to God in the whole of Creation. The universe is vast, and a bit of humility is good for the human race. God built – in order

> That Man may know he dwells not in his own –
> An edifice too large for him to fill.[12]

A poetic mindset assisted Milton as he faced the problems raised by the new worldview. The darker imagery, inspired as it appears to be by the new astronomy, was relegated to the Abyss and similar regions. But it would not stay there. At about the same time, and in a very different mood, Pascal was writing in his *Pensées*:

> I look at those appalling spaces of the universe which shut me in, and I find myself attached to one corner of that vast expanse, without knowing why I am set in this one spot rather than another; nor why this little time which has been granted to me to live has been assigned to this particular period rather than to any other . . . I see nothing but infinities on every side, and they shut me in . . . swallowed up as I am in the infinite immensities of space, which I do not know and which do not know me, I am terrified . . .
>
> The eternal silence of these infinite spaces frightens me.[13]

Here is a huge loss of cosmic confidence! The infinite spaces and timescales terrify Pascal by making him feel insignificant; yet this is not a very logical kind of fear. Our earthly environment remains unchanged, governed by the sun and the moon and perhaps very slightly by the planets. We can still live out our lives, irrespective of what happens in the rest of the universe. It is strange that anyone should care so much about such things, and curiously paradoxical to feel 'shut in' by infinity!

Changes of direction

As we have seen, the old, familiar imagery had now become seriously perturbed. Previously, the earth's position in the universe was humble through being 'low': the fact of being at the centre of it all by no means implied any particular *merit*. (The arenas in the Roman Empire may be recalled, in which the most prestigious people were the onlookers, and certainly not those at the literal centre of it all!) With the new cosmology, however, the earth's place in the universe is humble through being *unimportant*: it is an ordinary planet revolving in no special position about a very average star. At the centre of the planetary system is now the sun, symbolising light, power and glory and not 'lowness'.

It has been suggested that around this time in history, rising generations of European rulers may have been inspired to new heights of despotic magnificence by the new astronomical imagery: for example Louis XIV, the 'Sun King' of France. As the sun rules the planets absolutely, so the king rules his country. The sun no

12 Ibid., 8, 102f.
13 *Pensées*, 194, 205, 206 (Brunschvicg).

longer moves as a *servant* of the earth, along with its nocturnal partner the moon, but rules it instead. Attempts were made to identify the sun symbolically with God, but such a concrete and crude portrayal of the Deity is unsatisfactory. Further developments in astronomy, moreover, have demoted even the sun from this kind of symbolic position.

The new cosmic order also deprives everyday language and thought of some of its power. If Heaven is *literally* high, then the metaphorical usage of the word coincides with the literal. We have a sizeable vocabulary of words expressing value which are of this kind: *high, elevated, superior, low, inferior, base* and so on. No longer echoed in the cosmos, however, our sense of absolute values can easily seem undermined. Indeed, what now is 'height'? Today we look 'up' into the 'depths' of space – a contradictory and even disorienting state of affairs!

Rock pools?

If the universe is surrounded by Heaven, then the earth in space resembles an island in a vast cosmic sea, filled with the divine influence. And we all live in this milieu; it helps to bind us together. With the abolition of this worldview, however, it is all too easy to lose along with it the concept of the pervasive, environmental nature of God's presence. The universe now feels cold and dead – not to mention silent. Vestiges of faith merely remain within certain individuals, like rock-pools when the tide has gone out. The individual now has a sense of spiritual isolation. No longer does the rock dwell within the sea; traces of sea merely remain enclosed within certain fortunate rocks. This, at heart, seems to be the spiritual problem introduced by modern astronomy.

By the later nineteenth century, the consequences of these developments were beginning to be felt increasingly widely. Ostensibly, this was a period of flourishing churches and widespread religious belief and observance. But an undercurrent of unease and unbelief had begun to grow, and to be expressed in graphic terms. Friedrich Nietzsche in Germany asked: 'Where is God gone . . . ? We have killed him. . . . But how have we done it? How were we able to drink up the sea? Who gave us the sponge to wipe away the whole horizon?' The new situation was not at present apparent, however; it needed time to make itself felt by humanity. 'As yet the deed is even further from them than the furthest stars. . . .'[14] The turn of phrase is interesting, for this is precisely where the medieval scheme had located God. In a more pensive style, Matthew Arnold had written (in 1867) in his much-quoted poem 'Dover Beach':

> The Sea of Faith
> Was once, too, at the full and round earth's shore
> Lay like the folds of a bright girdle furled.
> But now I only hear
> Its melancholy, long withdrawing roar,

14 F. Nietzsche, 'The Madman', section 125 of *The Gay Science* (1882).

Retreating, to the breath
Of the night wind, down the vast edges drear
And naked shingles of the world.

No more sea now, just global dryness. The universe was appearing to be an inhospitable place.

Night winds

Our argument has been that modern astronomy has led many to see the universe as 'despiritualised'. Only within ourselves does faith now lie, and often then with difficulty if at all. Is this all a little over-melodramatic? Large numbers of believers might reply that they have never worried much about astronomy, that the Bible has little concern with the subject, and that their faith is not affected by these matters. I certainly have no quarrel with such a point of view. But my suspicion is that many other people are indeed affected by modern astronomy, consciously or unconsciously, for the kinds of reason indicated. Astronomy has always tended to have a connection with religion.

Let us take a closer look at the astronomical picture of the universe which has emerged over the past centuries. The first point of note, as mentioned, is its sheer size. The earth itself seems large indeed compared with the scales of ordinary human life, but our planet's diameter is less than a hundredth of that of the sun, and the distance between the sun and the earth is a hundred times larger still. It takes eight minutes for light to travel from the sun to us. Some two hundred thousand times further distant is the nearest star, several light *years* away, and even now we have hardly begun to penetrate our galaxy. Our galaxy, the Milky Way, is reckoned to be approximately 100,000 light years across from rim to rim of its disk-like structure. It contains of the order of a hundred thousand million stars, one of which number is our own Sun.

From our own galaxy to the Andromeda galaxy, its nearest large neighbour, is over two million light years, and even here we are still within just one group of neighbouring galaxies. Whether the universe is finite or infinite remains unknown, but there are estimated to be some hundred billion galaxies in the part of it observable by ourselves. The radius of the observable universe is some 15 billion light years.

Long before this point, though, the normal human sense of scale has utterly vanished. The sheer mind-bending enormity of it all is one reason why human beings do not easily feel 'at home' in the modern universe. Even the sense of wonder is strained! Yet the immense size of the universe is not as such the main problem; as we have seen, Ptolemy and his medieval followers were already at some level aware of it, and Milton revelled in it. More serious is the feeling of insignificance, and an inability to relate to the structure as a whole. We no longer look 'up' into the heavens – but in some random direction into an indeterminate distance. All this seems to undermine our relationship with its

Creator, which had apparently been based on our being at a special central position in Creation.

But also apparent through the telescope – and quietly dominating all that we see – is *blackness!* And however far and keenly we may attempt to penetrate it, blackness still seems to lie beyond. In ordinary life night's blackness is easy to accept, because it is temporary; we know it will be followed by the day. But the telescope deprives us of such consolations, for it seems to be informing us that there is a dismaying truth about the universe as a whole: sadly, permanent blackness and night are what *forever* lie in the background. And this can never be abolished, no, not by the most powerful telescope that one could ever make! Where, then, is God now to be found?

In the essay quoted above, Nietzsche queried what had become of the earth. 'Is there still an above and below? Do we not stray as though through an infinite nothingness? Does not empty space breathe upon us? Has it not become colder? Does there not come on constantly night and more night?' These echoes of Pascal were now being voiced by an outright atheist. If Pascal was frightened, at least he had his internalised faith in God, whereas Nietzsche had nothing but a faith in Man.

Modern astronomy seems to have generated a dramatic effect on the human outlook. The celestial spheres have been taken away, the nettle offered by Pascal and Nietzsche firmly grasped, and the entire former edifice now turned inside out! It is no longer heaven that surrounds us – but a hell-like outer darkness. Earth is apparently the best heaven we have. Human beings dwell and rule in this substitute heaven as a substitute for God. Man has become the measure of all things . . . but something vital seems to have disappeared.

'Infinite spaces'

Pascal's reaction to the new universe merits further examination. The problem with this kind of vastness is about more than just intellectual knowledge. It concerns an 'encounter'. Through the use of telescopes, something like a physical relationship between human beings and the universe is unveiled. The universe 'confronts' us. Now it seems to be a natural animal reaction to be alarmed by anything really large: there is a feeling of impotence, helplessness, insecurity. One feels as if under an unvoiced and nameless threat – and now it seems that the universe itself is producing this effect on us. In the words of one of London's inimitable taxi-drivers, philosophising during a trip once made by me in his cab: 'It's a way to go potty, looking up at the stars. I mean, if you look at all that lot and think, "This goes on for *ever*," you'd go round the bend!'

On the other hand, in connection with the experience of nature and its wonders, feelings of awe can have strong religious overtones and positively kindle a sense of religious awareness. To stand beneath the starlit sky at night can be a celebrated way to produce this kind of effect. In the psalmist's words:

> When I consider your heavens, the work of your fingers, the moon and stars which you have set in place; what is man that you are mindful of him, the son of man that you care for him? (Psalm 8).

We may well ask, then, what the difference is between awe and wonder of this kind, shared it seems by Milton, Dryden and many others, and the unease and fear reported by Pascal.

An important part of the answer is probably that the universe simply feels a more comfortable place if a person has a faith in God. A relationship with the Creator assists the relationship with Creation. Otherwise, one is much more prone to feel the bleak, 'modern' impression. But also, when we stand and contemplate the night sky, our feet are still comfortably on the earth. Viewing through a telescope – even by means of a photograph – is a more isolating kind of experience which conceptually detaches us from our planet. The level of familiarity with what is being contemplated also enters. Unfamiliar situations are liable to generate fear; and the modern universe seems to resist any attempt of the human imagination – as opposed to the intellect – to come to grips with it so as to give a sense of familiarity. It is well-nigh impossible for most people to comprehend the modern universe as a whole.

A further problem area concerns the question of *life*. In earlier ages, the planets moving in the night sky seemed to possess this in a rudimentary way, or something vaguely akin to it. In this manner, they could be associated with deities or with human fortune through astrological lore. Even without this, one had become used to the planets and stars almost as nocturnal companions. But now they are dead lumps of rock, or vast spheres of gas. They possess environments that are inhospitable or hostile to life. There can now be no more unconscious 'companionship' with the heavenly bodies. We now know them to be dead, and with a total indifference to our own existence.

If human colonies are ever set up on the moon and planets, it will be interesting to see if attitudes change again. The moon of today is no longer a romantic and mysterious nocturnal counterpart of the sun; the last vestiges of this vanished when its hidden side was photographed from spacecraft. It is now recognised as a crater-bespattered sphere of rock and black dust – almost provocatively unstimulating to the imagination. But the presence of colonies could transform the moon of tomorrow into something more like the Antarctica of today, now that useful quantities of frozen water have been discovered on it. The earth's south pole is of course nowhere near as hostile as the surface of the moon, but even there we still require an artificial environment to survive. Still part of our own planet, its surrounding terrain is virtually devoid of life; and the familiar round of regular light and darkness becomes perpetual day in summer, night in winter. The moon presents a similar situation, but more so. Could one expect that if the moon were colonised, it would eventually become 'geified' – that is to say, regarded as a familiar psychological extension of the earth?

But to return to the question of the vast and possibly lifeless stretches of the universe beyond the solar system: we do not know, of course, that there really is

no life around other stars. Let us imagine for now, however, that the rest of the universe is as dead as it appears, and that no such life exists. Does it matter? One part of our problem would seem to be a deep-rooted unease that, with regard to the rest of the universe, we are in a kind of indissoluble physical relationship with something totally vast and totally dead. As Pascal complained, these regions 'do not know me.' The irrationality of such feelings remains clear, of course. If all the rest of the universe is lifeless, it really makes no practical difference to ourselves.

Beneath lifelessness, however, there lurks a deeper suspicion of *godlessness*. If God is no longer beyond the outermost heavenly sphere, no longer present as a kind of backdrop to the universe, where then has He gone? It is of course a naive question: to the modern believer God dwells 'outside' the universe in a non-spatial sense, something for which we have no adequate language. Milton tried to express it in poetry. But it is extremely easy even today to hanker after a spatially located God. Perhaps we may suppose that if God is not located around the circumference of the universe then He must be *inside* it. In particular, being associated with life, God might be placed in the living world of nature. In the words of the poet, for instance, 'One is nearer God's heart in a garden than anywhere else on earth.'[15] And indeed, many today regard Nature in ways which have strong religious overtones.

But this kind of viewpoint is not in the end very satisfying either, for we know that to a good approximation the universe – that is to say, nature – is almost entirely empty space, whose immense distances are punctuated only occasionally by stars, dust and interstellar debris. These would appear to be divinely and humanly useless realms . . . there is a sense of god-forsakenness about outer space! In these dark and desolate reaches, no sparrow falls to the ground. Dust and rocks would seem to be no subject of divine concern. The vacuum of outer space does not even seem to be a pregnant vacuum, waiting for something to happen. It seems to have forfeited all such chances aeons ago. No life, no presence of God; so one is tempted to feel.

At home in a large universe

To summarise, it is evident that the modern view of the universe presents us with a number of profound challenges. One of these is whether we can hope to explain *why* the universe is so vast. A second concerns what kind of psychological attitude towards it would be most helpful. And most seriously of all, there is the question of what kind of spiritual attitude.

The physical question

Surprisingly, there are indications that the first question may actually be answerable. Two possible lines of explanation may be offered. The first is that

15 Dorothy F. Gurney, 'God's Garden' (1913).

modern cosmology offers strong suggestions that the size of the universe is connected with its development in time since the initial Big Bang. A 'small' universe with a mere few galaxies in it (though even this would still seem huge to us) would have a very much shorter lifetime than the present age of our own universe. As a consequence, it could not actually give rise to stars stable over the many millions of years that are believed necessary for life to develop on a planet such as we inhabit.[16] It is over this long timespan that the universe has expanded to the huge size that we now observe, its original high density having become so diluted that the universe is now nearly all almost empty space. Part of the answer to Pascal, then, may be that God has set up a universe that is actually big enough to work, big enough to provide a home for creatures such as ourselves. And it looks as if such a universe must be very big indeed.

Another way of accounting for the large size of the universe is more tentative: the currently most favoured cosmological theories (invoking a hypothesis known as 'inflation') require the universe to be mathematically on the boundary between being finite and infinite.[17]. This as such would imply infiniteness, but no theory is normally exact and a more precise theory could well correspond to a finite universe – but still extremely large from our point of view. Experimental measurements at the time of writing could correspond to either case, because of the uncertainties on the measurements. It is quite possible that the experiments will never be able to distinguish between a finite and an infinite universe.

If large numbers as such are worrying, it may be helpful to bear in mind that they are an unavoidable feature of our physical existence. Our bodies contain of the order of 6×10^{27} atoms! We are in a universe of large numbers, mind-stretchingly large. There is no escaping this, and we are compelled to marvel at the wonders of physical creation, viewed from all perspectives.

The psychological question

At the psychological level, it may perhaps be possible to imagine the earth as a kind of oasis in a vast cosmic waste. Theologically, however, this remains problematic, for God must be in relationship to all parts of the universe, and not just with our own planet. If we cannot give up the desire or need to associate God with a specific spatial location, then we will inevitably have problems with the universe uncovered by modern astronomy.

One solution to the kind of problem for belief considered here can perhaps be found in connection to how we relate to myth. To entertain their children and assist their early development, parents teach them various myths and fairy tales. These may contain certain important truths, but the imagery is not literally true, and part of the process of growing up is to discern the difference between mythology and objective truth. Nonetheless, it is wrong to throw away the truth in the

16 Barrow J.D. and F.J. Tipler, *The Anthropic Cosmological Principle*, Oxford: Oxford Univ. Press (1986) p. 384f.
17 See for example review articles in *Scientific American*, Jan. 1999.

myths. I would argue that the theological truth behind the medieval cosmos-myth is something we need to retain, while acknowledging that the picture itself is not to be taken literally.

It will be clear by now that far beyond merely abolishing the medieval cosmos-picture, which might be called a myth with pro-God elements, modern astronomy presents itself to many as giving a picture with, effectively, anti-God elements. This picture may be literally and scientifically true, but I would suggest that its effects on our imaginations and emotions are essentially just as 'mythological' as those of the medieval picture. They work in the opposite direction, of course. We need to distance ourselves from this dark modern mythology just as we did from the more comfortable medieval one.

The background night sky is black, in fact, for reasons to do with the expansion and large size of the universe. The energy and intensity of the light from distant galaxies become reduced; moreover this light can reach us only from finite (albeit very large) distances. Were this not so, we could have starlight and heat coming at us from absolutely every direction. The universe would then resemble a furnace in which no solid matter could survive. The restful blackness preserves us from this, and permits our safe existence.

All this means that in evaluating whether there is a God behind the universe, subjective impressions of a mythological kind must be tempered with rationality. Is it really implausible that God should have created such an immensely vast universe? Presumably not: it may well have been essential. In any case we should try to have sufficient courage not to be afraid of it. It would be helpful, of course, if we could form an understanding of God's relation to the universe capable of replacing that of the Middle Ages – but note that we need 'an understanding', not 'a picture'. The troubles have come about mainly because of our use of visual thinking. The pictures, as it were, have now tended to go bad.

The spiritual question

Regarding the western conception of God and the universe, three factors are of particular importance. The first is the doctrine of Creation. Christians, Jews and Muslims believe that God *created* the universe; this means that the universe possesses an existence of its own, distinct from God, which in turn implies a certain element of separation between God and the universe. The dark modern reaction to the universe totally exaggerates this separation, but it exists at some level and must be lived with. A second factor is that images of God have always been in principle forbidden in these faiths. This ban on images must now be extended to pictorial thinking about 'where God is' – or we shall be in trouble. The third factor is that, nevertheless, God has always been considered as 'close' to Creation.

The nature of this closeness is a subject in itself, but it must be closeness in a spiritual rather than physical sense. Those who seek a spatially located God will search in vain. Nevertheless, God is always and everywhere in some sense present

and able to give personal support, no matter who we are or however far into outer space we go. Space, to use Milton's word, is not 'vacuous'. It means that if we are indeed 'rock pools', then there is always a source of water that is able to seep up and fill each pool. Surely, indeed, the image has to change. If God is really an ever-present source of life and inspiration for human beings, then we have to sense ourselves more as *springs* than as rock pools!

At the same time, let us remember the psalmist's own answer to the question 'what is man?' It is that 'You have made him a little lower than the heavenly beings and crowned him with glory and honour.' This is an affirmation of the human significance which modern astronomy seems to deny – but an affirmation at the spiritual rather than the physical level. Somehow, belief in God and belief in ourselves go together.

A writer whose point of view remains highly relevant is St. Augustine, who lived around the year 400. In contemplating the relationship of God with the universe, it became clear to him that the heavens which surround the earth could not possibly be the dwelling-place of God. God, he wrote, dwells in the 'Heaven of Heavens', something with a confusingly similar name to the ordinary 'heavens' above the earth but actually quite different. It is timeless, he says, and an 'intellectual' creation.[18] This opens many questions, but at least it points the way to an understanding involving more than just the physical dimensions of space.

Finally, let us return briefly to Pascal and his feeling of being 'shut in by infinity'. It is a telling and paradoxical phrase: why should infinite space seem more claustrophobic than finite space? The reason is surely that beyond the bounds of 'finite' space, Pascal would have inferred the presence of something 'beyond', liberatingly infinite but in a *different* way: no doubt a kind of 'spiritual dimension', analogous to the medieval heaven. Infinite space does not allow this kind of escape route into the spiritual. But like St Augustine earlier, we can surely recognise today that the spiritual dimension is not to be visualised as any kind of quasi-spatial extension to the physical universe. Whether the universe is finite or infinite, bounded or unbounded is in the end irrelevant to this point. It is in other directions that the spiritual is to be sought.

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18 St Augustine, *Confessions*, London: Penguin Books, ch. 12.