Aristotle, On the Heavens, Book II, Part I

That the heaven as a whole neither came into being nor admits of

destruction, as some assert, but is one and eternal, with no end or

beginning of its total duration, containing and embracing in itself the

infinity of time, we may convince ourselves not only by the

arguments already set forth but also by a consideration of the views

of those who differ from us in providing for its generation. If our view

is a possible one, and the manner of generation which they assert is

impossible, this fact will have great weight in convincing us of the

immortality and eternity of the world. Hence it is well to persuade

oneself of the truth of the ancient and truly traditional theories, that

there is some immortal and divine thing which possesses movement,

but movement such as has no limit and is rather itself the limit of all

other movement. A limit is a thing which contains; and this motion,

being perfect, contains those imperfect motions which have a limit

and a goal, having itself no beginning or end, but unceasing through

the infinity of time, and of other movements, to some the cause of

their beginning, to others offering the goal. The ancients gave to the

Gods the heaven or upper place, as being alone immortal; and our

present argument testifies that it is indestructible and ungenerated.

Further, it is unaffected by any mortal discomfort, and, in addition,

effortless; for it needs no constraining necessity to keep it to its path,

and prevent it from moving with some other movement more natural

to itself. Such a constrained movement would necessarily involve

effort the more so, the more eternal it were – and would be

inconsistent with perfection. Hence we must not believe the old tale

which says that the world needs some Atlas to keep it safe – a tale

composed, it would seem, by men who, like later thinkers, conceived

of all the upper bodies as earthy and endowed with weight, and

therefore supported it in their fabulous way upon animate necessity.

We must no more believe that than follow Empedocles when he says

that the world, by being whirled round, received a movement quick

enough to overpower its own downward tendency, and thus has been

kept from destruction all this time. Nor, again, is it conceivable that it

should persist eternally by the necessitation of a soul. For a soul

could not live in such conditions painlessly or happily, since the

movement involves constraint, being imposed on the first body,

whose natural motion is different, and imposed continuously. It must

therefore be uneasy and devoid of all rational satisfaction; for it could

not even, like the soul of mortal animals, take recreation in the bodily

relaxation of sleep. An Ixion’s lot must needs possess it, without end

or respite. If then, as we said, the view already stated of the first

motion is a possible one, it is not only more appropriate so to

conceive of its eternity, but also on this hypothesis alone are we able

to advance a theory consistent with popular divinations of the divine

nature. But of this enough for the present.

Book II, Part III

Since circular motion is not the contrary of the reverse circular

motion, we must consider why there is more than one motion,

though we have to pursue our inquiries at a distance – a distance

created not so much by our spatial position as by the fact that our

senses enable us to perceive very few of the attributes of the

heavenly bodies. But let not that deter us. The reason must be sought

in the following facts. Everything which has a function exists for its

function. The activity of God is immortality, i.e. eternal life. Therefore

the movement of that which is divine must be eternal. But such is the

heaven, viz. a divine body, and for that reason to it is given the

circular body whose nature it is to move always in a circle. Why, then,

is not the whole body of the heaven of the same character as that

part? Because there must be something at rest at the centre of the

revolving body; and of that body no part can be at rest, either

elsewhere or at the centre. It could do so only if the body’s natural

movement were towards the centre. But the circular movement is

natural, since otherwise it could not be eternal: for nothing unnatural

is eternal. The unnatural is subsequent to the natural, being a

derangement of the natural which occurs in the course of its

generation. Earth then has to exist; for it is earth which is at rest at

the centre. (At present we may take this for granted: it shall be

explained later.) But if earth must exist, so must fire. For, if one of a

pair of contraries naturally exists, the other, if it is really contrary,

exists also naturally. In some form it must be present, since the

matter of contraries is the same. Also, the positive is prior to its

privation (warm, for instance, to cold), and rest and heaviness stand

for the privation of lightness and movement. But further, if fire and

earth exist, the intermediate bodies must exist also: each element

stands in a contrary relation to every other. (This, again, we will here

take for granted and try later to explain.) these four elements

generation clearly is involved, since none of them can be eternal: for

contraries interact with one another and destroy one another.

Further, it is inconceivable that a movable body should be eternal, if

its movement cannot be regarded as naturally eternal: and these

bodies we know to possess movement. Thus we see that generation

is necessarily involved. But if so, there must be at least one other

circular motion: for a single movement of the whole heaven would

necessitate an identical relation of the elements of bodies to one

another. This matter also shall be cleared up in what follows: but for

the present so much is clear, that the reason why there is more than

one circular body is the necessity of generation, which follows on the

presence of fire, which, with that of the other bodies, follows on that

of earth; and earth is required because eternal movement in one

body necessitates eternal rest in another.

Book II, Part VI

We have next to show that the movement of the heaven is regular

and not irregular. This applies only to the first heaven and the first

movement; for the lower spheres exhibit a composition of several

movements into one. If the movement is uneven, clearly there will be

acceleration, maximum speed, and retardation, since these appear in

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all irregular motions. The maximum may occur either at the startingpoint

or at the goal or between the two; and we expect natural

motion to reach its maximum at the goal, unnatural motion at the

starting-point, and missiles midway between the two. But circular

movement, having no beginning or limit or middle in the direct sense

of the words, has neither whence nor whither nor middle: for in time

it is eternal, and in length it returns upon itself without a break. If

then its movement has no maximum, it can have no irregularity,

since irregularity is produced by retardation and acceleration.

Further, since everything that is moved is moved by something, the

cause of the irregularity of movement must lie either in the mover or

in the moved or both. For if the mover moved not always with the

same force, or if the moved were altered and did not remain the

same, or if both were to change, the result might well be an irregular

movement in the moved. But none of these possibilities can be

conceived as actual in the case of the heavens. As to that which is

moved, we have shown that it is primary and simple and

ungenerated and indestructible and generally unchanging; and the

mover has an even better right to these attributes. It is the primary

that moves the primary, the simple the simple, the indestructible and

ungenerated that which is indestructible and ungenerated. Since

then that which is moved, being a body, is nevertheless unchanging,

how should the mover, which is incorporeal, be changed?

It follows then, further, that the motion cannot be irregular. For if

irregularity occurs, there must be change either in the movement as

a whole, from fast to slow and slow to fast, or in its parts. That there

is no irregularity in the parts is obvious, since, if there were, some

divergence of the stars would have taken place before now in the

infinity of time, as one moved slower and another faster: but no

alteration of their intervals is ever observed. Nor again is a change in

the movement as a whole admissible. Retardation is always due to

incapacity, and incapacity is unnatural. The incapacities of animals,

age, decay, and the like, are all unnatural, due, it seems, to the fact

that the whole animal complex is made up of materials which differ

in respect of their proper places, and no single part occupies its own

place. If therefore that which is primary contains nothing unnatural,

being simple and unmixed and in its proper place and having no

contrary, then it has no place for incapacity, nor, consequently, for

retardation or (since acceleration involves retardation) for

acceleration. Again, it is inconceivable that the mover should first

show incapacity for an infinite time, and capacity afterwards for

another infinity. For clearly nothing which, like incapacity, unnatural

ever continues for an infinity of time; nor does the unnatural endure

as long as the natural, or any form of incapacity as long as the

capacity. But if the movement is retarded it must necessarily be

retarded for an infinite time. Equally impossible is perpetual

acceleration or perpetual retardation. For such movement would be

infinite and indefinite, but every movement, in our view, proceeds

from one point to another and is definite in character. Again, suppose

one assumes a minimum time in less than which the heaven could

not complete its movement. For, as a given walk or a given exercise

on the harp cannot take any and every time, but every performance

has its definite minimum time which is unsurpassable, so, one might

suppose, the movement of the heaven could not be completed in any

and every time. But in that case perpetual acceleration is impossible

(and, equally, perpetual retardation: for the argument holds of both

and each), if we may take acceleration to proceed by identical or

increasing additions of speed and for an infinite time. The remaining

alternative is to say that the movement exhibits an alternation of

slower and faster: but this is a mere fiction and quite inconceivable.

Further, irregularity of this kind would be particularly unlikely to pass

unobserved, since contrast makes observation easy.

That there is one heaven, then, only, and that it is ungenerated and

eternal, and further that its movement is regular, has now been

sufficiently explained.