it is natural for us to think that space moves when its containing body does. Since it is so natural for us to think in this way, Aristotle refutes this notion of space in particular with his second argument.

212. This is Aristotle's first argument to show that place cannot be a space:

> But there is no such extension. One of the bodies which change and are naturally capable of being in contact with the container falls in - whichever it may chance to be. If there were an extension which were such as to exist independently and be permanent, there would be an infinity of places in the same thing. For when the water and the air change places, all the portions of the two together will play the same part in the whole which was previously played by all the water in the vessel.[1]

Plainly, this argument needs a great deal of expansion. Therefore, before we begin to examine it, we will present the explanation of St. Thomas.

> About the first of these he says that it is not true that there may be something there within the extremes of the containing body except the contained body which is borne from place to place, but some body falls within those extremes of the containing body, whatever that may happen to be, of such a kind, nevertheless, that it is among the number of mobile bodies and again among the number of those which are naturally apt to touch the containing body. But if there could be some middle containing space, in addition to the dimensions of the body contained, which would always remain in the same place, this inconsistency would follow, that there would be infinite places together. And this is so because, since water and air have their proper dimensions, both each body and each part of a body, all the parts do the same thing in the whole that the whole water does in the vessel. Truly, according to the position of those who hold the opinion about space, while the whole water is in the vessel, there are other dimensions of the space there in addition to the dimensions of water. But every part is contained by the whole as what is in place by the

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[1] Aristotle, IV Physics, Ch. IV, 211b16.

> vessel, nor is there any difference except only in this respect, that the parts are not divided, but what is in place is divided. Therefore, if the part were divided in act, it would follow that there would be there other dimensions of the containing whole in addition to the dimensions of the part.
>
> But it cannot he said that division would make some dimensions newly to exist, for division does not cause dimensions, but divides a preexisting one. Therefore, before the part was divided, there were other proper dimensions of the part, also penetrating the part, in addition to the dimensions of the whole. Thus, there will be as many dimensions distinct from each other there, certain of which will penetrate others, as there are parts to take through division in some whole, so that one (part) contains another. But there are parts one may take which contain other parts to infinity in any continuous whole on this account, that the continuum is divided infinitely. Therefore, it remains that there may be infinite dimensions penetrating each other. Therefore, if the dimensions of the containing body penetrating what is in place are place, it follows that there are infinite places together, which is impossible.[1]

213. Aristotle and St. Thomas begin by remarking that the dimensions within the inner surface of a container are never found without a body being found within the container also. Thus, when one body goes out of the container another goes into it. Inasmuch as one observes from common experience that this is the case (when water is poured from a jar air goes into it) one can see this statement to be a probable one. It corresponds with our common experience. At the same time, one must appreciate that when Aristotle considers the void he will give arguments expressly ordered to proving the truth of these remarks. To that extent these remarks must now be taken by the student on faith.

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[1] St. Thomas, IV Physicorum, Lect. VI, n. 461(7).

214. By making these remarks here, Aristotle and St. Thomas do two things. First, they put the student in the correct frame of mind. For when previously giving the argument to show that place is space, St. Thomas said, "Because if there were no other thing there (between the inner extremes of the containing body) except that body (which is contained), it would follow either that place would not be other from the placed, or that that which is a middle between the extremes of the container could not be place." By affirming the antecedent here, i. e. there are no dimensions separated from the dimensions of the body contained, they affirm the consequent, i. e. either place is not separable from what is in place, or place is not the dimensions between the inner surface of the container. Since we have already agreed that a place is separable from what is in it, it follows that the place of a thing is not the dimensions referred to. As we have said, the antecedent is probable from common experience, and Aristotle will give arguments indicating its truth later on. How the consequent follows from the antecedent is not difficult to see. Thus, by making these remarks first, Aristotle and St. Thomas lead the student toward the truth.

215. Second, by making this assertion, a difficulty is avoided which might cause the student to hesitate to accept the argument to be given immediately. For if one thinks there are, in fact, separated dimensions penetrating a body, one

will still be led by his imagination to think of a place as a space, despite the following arguments. Such is the power the imagination has over us. Therefore, to avoid this tendency, the opposite is affirmed here. Accordingly the imagination is rectified and we are made more receptive of the argument to be given.

216. Having indicated these things, Aristotle (and St. Thomas) argue that place cannot be a space because then there would have to be an infinite in act, which we have already excluded. For each thing which comes into a place has its own proper dimensions. Thus, if some vessel is filled with water, the water as a whole is in the jar as a whole. If the place of the water is a separated dimension or space, there must be actual dimensions of the water as a whole. But there is no reason to suppose that all this water in the vessel is simply one. Rather, it would seem to be one only in some respect, but simply many. In other words, it has many parts actually divided one from another, these parts being contiguous with one another, not continuous.[1] For water, each of these parts has a certain size. The same thing is true of air in the jar when the water has been poured out of the jar and the air has entered it. The air has certain actual parts, each of a certain size. But it would seem likely that the actual parts of the air are not the same size

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[1]See par. 193-200.

as the actual parts of the water. This would seem to be what St. Thomas is referring to when he says "...water and air have their proper dimensions..."

217. We may say, then, that in the whole of the water in the jar there are actual parts. Furthermore, there are other parts of the water as well, parts which are only potentially divided from each other. For the actual parts of the water, the ones having the proper dimensions of water are potentially divisible but not actually divided into parts. As we indicated above, the actual parts of a whole, being contiguous with each other, and through the other parts with the whole, are in the whole (or those parts contiguous to them) as what is in place is in place.[1] Those parts which are continuous with a whole (in the present case considering each actual part to be a whole) are in the whole not as in a place, but as a part is in a whole. We distinguish the potential parts from the actual ones, the ones contained by their container as by a place, merely by the fact that the actual parts have been actually divided from each other, the potential ones being only potentially divided from each other. But if these divisions were actually made, if the potential parts were actually to be divided from each other, the result would be that the parts of the parts would also be contained by their container as by a place, for we have pointed out

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[1]Par. 193.

that parts which are contiguous are in place.

218. Since by actualizing a division, by making actual parts of those which were previously only potential parts, we increase the number of contiguous parts and therefore the number of places necessary for them so that there will be a place for each part demanding one, it follows that there will be more places evidently necessary after the division than were plainly necessary before it. As the body is divided more and more, it becomes plain that there is a vast multitude of places necessary for the parts. Since, according to the opinion we are now considering, place is dimensions or space, it follows that a vast multitude of dimensions is necessary in order that each actual part may have its own space or dimensions. Since a body is infinitely divisible (i. e. there is no limit to the divisions which can be made), it must be that there is an infinite multitude of dimensions which contain all these parts.

219. In considering the argument as it has proceeded thus far, one must note that no difficulty has yet been shown to exist. For it seems that if a body can be divided infinitely, so can the dimensions or space which contain it. Since, as was shown when we treated the infinite, a body can be divided infinitely only in potency, so it seems that the number of separated dimensions necessary for the parts resulting from the division is never actually infinite and that therefore no impossibility results from what has been said thus far.

220. However, by a further analysis Aristotle and St. Thomas (more explicitly) show that there would have to be an infinity of spaces in act, not just in potency, if place were space. This proof is given (very concisely) in the second paragraph of St. Thomas quoted above. For body, because it is continuous, is infinitely divisible.[1] The division of a body into actual parts (smaller bodies) merely actualizes the potentiality of being divided, a potency which is without end. Yet, the fact that a body is infinitely divisible does not mean that it is ever entirely divided, that its potency is ever fully realized. In fact, no body is ever actually divided infinitely. But, supposing place to be a space, it cannot be this way with the infinity of spaces or separate dimensions. Whenever a body is divided into actual parts, there must be separate spaces for each part (now a distinct body) actually existing. Because these separate or distinct spaces cannot have been produced by the division of the body, it must be that these places or spaces actually exist before the division of the body. This implies that there must be an actual infinity of spaces existing before the body is divided. For if there were only a finite number of them, however large this number might be, it would still be possible for a body to be divided into still smaller actual parts (these parts remaining finite in number) which

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[1] St. Thomas, III Physicorum, Lect. I, n. 277(3).

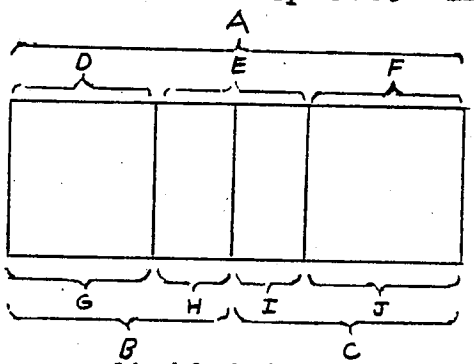
parts would not each have a distinct place (space). Since every body must have a place, we must therefore conclude that, if place is space, there must be an actual infinity of places. Since we have shown that one must not propose an actual infinity in nature, we must reject the notion that place is space.

221. In order for the force of this argument to be understood, it must be seen why the division of a body cannot produce a division in the space which is proposed to be place, so that, as the number of parts of a body is increased by division, the number of new spaces to contain them is increased also, for each new part there being a new space. For if this were possible, it would not be necessary that there be an <u>actual</u> infinite multitude of spaces in order that each actual part of a body <u>potentially</u> divisible without end might have a place. The only infinity of space required would be a potential infinity, which would offer no difficulty. St. Thomas does not prove in detail that the division of a body cannot entail the division of space. But it can be shown that such an hypothesis is untenable.

222. First of all, if one supposes that by dividing a body we divide the place (space) containing it, there are several questions left unanswered. On this hypothesis, the very division of a body entails the division of its place. Let us suppose we have divided a body into two equal parts. Now, if this body is made one again, what happens to the two

spaces? Are they also united into one space again, or do they remain two? There seems to be no more reason to take one alternative than the other. Let us take each of them in turn.

223. If it were supposed that two spaces would remain when the parts of the body divided in two were reunited, one would have to hold, in general, that the number of spaces in any given volume would be determined by the number of bodies of different dimensions which had been there previously. Thus, if another body were placed in the volume we considered above to be divided into two equal spaces, and if this second body were then divided into three equal parts, the volume of space occupied by the body would contain, not three but either six or four spaces, depending upon whether the larger spaces are proposed to be merely the sum of the smaller spaces or are proposed to be totally distinct spaces, interpenetrating with the smaller spaces. In the figure below, when a volume



has been divided into two and then three equal spaces, it may be said that the original space A exists, as well as spaces B and C, which arose when the original body was divided into two, and D, E and F, which arose when the second body was divided into three equal parts. In this case, one supposes that the larger spaces interpenetrate with the smaller ones. Or it might be said that the result of

these divisions is that the body divided equally into the three parts actually occupies the four spaces G, H, I and J, the middle body actually occupying the two spaces H and I, since the space was previously divided there permanently into two parts when the previously occupying body was so divided. In this case, one supposes that the larger spaces, instead of interpenetrating with the smaller ones, are composed of them. There is a difficulty with each of these alternatives. If it is supposed that there are six spaces present, one has really departed from the original hypothesis, for when the body is divided, it is no longer being held that the space occupied by the whole is being divided, since it remains to be counted, together with the spaces resulting from the division of the body. Rather, one is holding that by dividing a body, one is producing new spatial dimension, not dividing the old one. But this is truly absurd. One divides dimensions by division. One does not produce new ones in addition to the old one by dividing the old one.

224. On the other hand, if it is supposed that there are four spaces present in the case we have been describing, it seems strange that the body with the dimensions E must occupy two spaces, H and I, whereas the other equal bodies D and F each occupy one space G and J respectively. Hence, instead of saying that every body is in a place, we would have to say that every body is in at least one place, but may, in fact, be in two or even more places, though the body

is not itself actually divided into two parts. Or would it be more correct to say that because a body is in two places (being where there were two smaller bodies before), the body is, in fact, actually divided? If this is the case, a body may be said to be more and more actually divided according as it is where there have been more and more or smaller and smaller bodies previously. This would seem to be most unlikely. But if this is not the case, if the body is not actually divided by the fact that it is in two places (spaces) at once, it also follows that a single body, by a single local motion, tends toward two distinct places. But this also seems extremely unlikely.

225. Thus, it is difficult to maintain that the body in question above is contained by either six or four places (spaces), and therefore it is extremely doubtful that these spaces may remain when the parts of a body are reunited so as to remake the one original body.

226. On the other hand, if the other alternative be taken, if it be supposed that when the parts of the body are reunited the many spaces of the parts are also reunited to make one space again, other difficulties arise. How are we to distinguish between a body and its place (space)? When a body is divided, its place is divided, when its parts are reunited the parts of its place are reunited. Further, the dimensions of space interpenetrate with and correspond perfectly to those of the body itself. Indeed, instead of

being immobile, the space (place) would seem to be mobile, just as the mobile body itself is. For wherever the body goes, there we find the dimensions of a separated space exactly equal to the body, whereas the place (the dimensions of the space) it leaves behind disappear as the body moves away, unless another body equal to it moves in when the one moves out, for we have seen that the present hypothesis demands a body equal in dimensions to a place (space) and occupying it if the place itself is to exist. Thus, it would seem more reasonable to suppose that a body brings its space with it as it moves than to suppose that it produces spaces one after another as it moves from somewhere to somewhere else, as it were destroying the spaces it previously occupied as it departs from them. In this case, space could not be place, because space moves with a body, whereas place does not.

227. Further, just as the division of a body cannot be said to produce different spaces (places) for the resultant parts if the different spaces are supposed to remain when the parts are reunited, so these distinct spaces for the parts cannot be ascribed to the very division of the body itself if the other alternative is taken, if it is supposed that the spaces of the parts cease to be distinct when the parts contained by them are reunited but this is so for a different reason. Suppose two smaller bodies to be moved into a space previously occupied by a single body. The space which was

one before is now two. But it was not the division of the body into two which made the one space two, for the two bodies which now are present never were one. Thus, there is no act of division of a body which can be said to have made the one space two. How did it come about, then?

228. Further, one might ask what this hypothesis of place being space actually accomplishes. We can observe local motion and therefore, it seems, in some way, however confused, we must be able to observe place. Otherwise, what would motion from place to place mean to us? But we cannot observe this space. All we can observe is the dimensions of bodies themselves, not some other dimensions, immobile and interpenetrating with these.

229. The difficulties we have raised thus far are not meant to decide the question in themselves, but rather they are meant to lead the mind to perceive how arbitrary and artificial rather than natural is the position that place is an immobile space which is gradually divided into smaller and smaller spaces as the body it contains is divided into such parts. Considering the contradictions and artificial choices which seem to arise under this hypothesis, the mind is inclined to view the hypothesis itself as imaginative but unnatural. Thus, because the imaginative appeal of the hypothesis is greatly weakened, the mind is made receptive to the more fundamental reason why the space proposed to be place cannot be held to be divided into parts step by step,

gradually, as the contained body is divided. This root reason is that a place must be independent of the body in it. If a space is to interpenetrate with the dimensions of a body, and yet be something distinct from the dimensions of the body itself, the space must be independent of the body in it. If it were not independent, it could not really be distinguished from the dimensions of the body itself, and thus space would not be place. Indeed, space is always imagined to be something independent of the bodies in it when it is held to be place. But as soon as a space is held to be independent of the dimensions of the body in it, the division of these dimensions cannot result in the division or multiplication of the spaces the body occupies.

230. Therefore, since the division of a body cannot result in the division or multiplication of spaces, and since a body can be divided without end, each body resulting from this division having a separate place, it must be that there is an actual infinity of spaces if place is space of the sort we have been considering. Hence, the argument given above[1] must be held valid. We must conclude that place cannot be this kind of space.

231. Concerning this argument showing that place cannot be a space or dimensions, several remarks might be

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[1] See par. 212.

made. In the first place, it depends upon what was previously determined about the infinite in book three. But we saw when treating Aristotle's argument there, that the existence of an actual infinite in nature is to be rejected because of the principle of simplicity or economy. Since everything in nature can be explained without reference to more than a potential infinite, we should not propose the existence of an actual infinite. For it is vain to propose more to explain something than is necessary to explain it. We have now shown that if place is a space, there must be an infinite in act in nature. If it were necessary that place be a space, we would now have to say that there is an actual infinite in nature. But since, in fact, place can be something other than a space, as we will show below, by the principle of economy we must maintain that place is this other thing. In other words, in this respect this argument against the view that place is a space is valid if, and only if, there is something else which place can be.

232. In the second place, the argument depends upon natural bodies being divisible infinitely. But in his commentary on book one, St. Thomas says:

> But it must be said that although body, mathematically taken, is divisible to infinity, nevertheless natural body is not divisible to infinity. For in a mathematical body only quantity is considered, in which nothing is found repugnant to division to infinity, but natural form is considered in a natural body, which (form) requires a determined quantity as other (determined) accidents. Hence, quantity can be found in the species of flesh only

within some determined limits.[1]

And in commenting on book six he adds this explanation.

> Therefore, to this it must be said that we can speak about the nature of some thing in two ways, either according to a common reason (rationem) or according as it is applied to proper matter. And nothing prohibets something which is not impeded from the common reason (ratione) of the thing from being impeded from the application to some determined matter...
>
> And similarly it is not against the reason (rationem) of magnitude that any magnitude be divided into magnitudes, and therefore in this book he makes use of (the notion) that one may take something smaller in any given magnitude, although in applying magnitude to a determined nature there may be some minimum magnitude, because any nature requires a determined magnitude and smallness, as was said in the first book.[2]

Thus we see that Aristotle has argued here from a notion which is true only when one makes a general consideration of nature. Natural things, as they exist physically, i. e. as contracted to this or that form, are not divisible infinitely. Since we are trying to find the place of physical existing things, one might be led to suppose that the argument we have been analysing is useless. But this is not the case. In order to understand this, three things must be noted.

233. First, it is reasonable for Aristotle to proceed from things taken commonly here since we are considering nature in general. By beginning from what is more common he is arguing from what is more known to us. Now, from this consideration alone, one might be led to suppose that by this

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[1] St. Thomas, I Physicorum, Lect. IX, n. 66(9).

[2] St. Thomas, VI Physicorum, Lect. III, n. 774(9).

argument Aristotle has excluded place from being space only in a general way, with respect to a common knowledge of things and on this general level alone, but that this subject will have to be taken up again when a more concrete or detailed examination of nature is made.

234. However, it is not as simple as this. For the second thing one must note is that even the general argument given here by Aristotle proves that for place to be a space as described above would be a very strange thing indeed, even according to the way physical things actually exist in the concrete. For if place is a space, there must be existing in act as many dimensions as there are parts and wholes of various sizes (the wholes and parts of water and air would seem to be of different sizes) possible in any given place. If it be admitted that we should not propose an actual infinity of existing dimensions, we must propose that there is some finite number of these dimensions everywhere, whatever that number might be. This means that the determinate number of dimensions or places actually existing must set an upper limit to the number of times a body in it may actually be divided and perhaps limit the kinds of bodies which may be in a particular place since the dimensions of particular kinds of bodies and their parts are different. This seems strange indeed, for how could it be that place itself, something extrinsic (at least in the sense of something separable from the thing) sets a limit to the number of times a body may be

divided? Plainly, such a thing would be incredible. Therefore, since there cannot be an infinity of separated dimensions existing in act, place cannot be a space.

235. Third, one must note that it is not absolutely certain that there is a definite limit to the physical divisibility of magnitudes in physical things in at least one sense. For though there is a limit to the divisibility of magnitude under any given form by virtue of the demands of that form, this does not prove that the magnitude is not, in fact, divisible infinitely. It merely proves that if that magnitude is divided which is the minimum magnitude some given form may possess, the composite to which the minimum magnitude belongs is corrupted. It remains possible that the parts into which the minimum (for this form) magnitude were divided may, when the division has been effected, have another form after the division has been effected, one the minimum for which is less than that of the original form. The minimum magnitude for this form may again be divided, the result being a still smaller magnitude, one which is possessed by still another form. From the fact that there is a limit to the minimum magnitude any particular form may have, it does not follow that there is any limit to the possible distinct kinds of form to which the division of magnitudes into smaller and smaller magnitudes may give rise. Of course, this is not to say that it is possible for there to be an infinitely small magnitude. It merely indicates that we do

not see very clearly that there is a definite limit to the possible smallness of magnitudes. On the other hand, there is no evidence that this kind of division is really possible and there is some vague evidence from modern science that it is not.

236. In conclusion, then, we may say that while Aristotle has not given here an incontrovertible proof that place cannot be a space, he has shown the difficulty of holding this position. If there is any other thing which place may possibly be, we cannot hold that place is a space or separated dimensions as described above.

237. The refutation of the argument previously given to show that place is space will be given below.

238. Having given this first argument, Aristotle gives a second argument to show that place cannot be a space. As we have said above,[1] this second argument refutes the opinion that place is space taking "space" in a somewhat different sense of the word. The first argument is a refutation of place being space, whether "space" be taken to mean an entirely immobile space or one mobile in some way, though it might be said to refer to an absolutely immobile space for the reason given above.[2] This second argument is a refutation of the opinion that place is space, taking "space" to refer

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[1] Par. 207-211.
[2] Par. 210-211.

only to a space which is in some way mobile. This is the way Aristotle presents the argument.

> At the same time the place will be undergoing change; sothat there will be another place which is the place of the place, and many places will be coincident. There is not a different place of the part, in which it is moved, when the whole vessel changes its place: it is always the same, for it is in the (proximate) place where they are that the air and the water (or the parts of the water) succeed each other, not in that place in which they came to be, which is part of the place which is the place of the whole world.[1]

And St. Thomas presents the first part of the argument as follows:

> If the dimensions of the space which is between the extremities of the containing body are place, it follows that place may be transported (from place to place). For it is plain that when some body has been transported, for instance a jar, that space which is between the extremities of the jar is transported, since it may be nowhere except where the jar is. But everything which is transported to some place is penetrated by the dimensions of the space into which it is transported, according to their opinion. Therefore, it follows that some other dimensions penetrate the dimensions of that space of the jar. And thus, there will be a place of another place, and there will be many places together.[2]

This argument is one against a very particular position, against the position that the place of a thing is the space between the internal boundaries of the containing body, this space being attached in some way to this containing body. If one supposes place to be a space, one may easily be led to the opinion that the space which is place must be a space attached to the containing body because how else can one space

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[1] Aristotle, IV Physics, Ch. IV, 211b23.

[2] St. Thomas, IV Physicorum, Lect. VI, n. 452(3).

be distinguished from another? And it must be so distinguished because, after all, we propose the existence of place because we observe bodies moving from place to place. This implies that one place is distinguishable from another. Otherwise, we would not know that things move from place to place. Since the only way we can distinguish one space or place from another is with reference to some body, and since the only body with which a space must be in contact is the surrounding body, a space must be determined with reference to the containing or surrounding body.[1]

239. But if the place (space) is determined by the container, when the container moves, as in fact often happens, the place must move with it. But when the container moves, it goes from place to place. When the container has reached a new place (space), the space contained by it is there with it. But when this container is in its new place, since the place is a space (according to the present opinion), it is wholly penetrated by this new place (space). Since the space determined by the original container was brought along with the container, it, too, must be penetrated by the new space (place). The original space, then, being penetrated by the new space (place) is itself in a new place. Thus, place is

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[1]Obviously, it cannot be determined by that of which it is the place because then the space (place) could not be separated from what is in it.

in place. Since this is incredible, we must deny that place is this kind of space.

240. A fundamental reason for the difficulty in holding that place is a space of this kind is that it makes the place of an actual part changed per se when the place of the whole is changed. In order to see that this is impossible, we must recall the distinction given previously between the proper place of a thing and its common place.[1] There it was shown that the primary or proper place of a thing is the place equal to it, and that it is in the other places greater than it is by virtue of something else. For instance, I am in the heavens because I am in the air and the air is in the heavens. From this it follows that I am in the heavens or in general in a common place per accidens. When the common place of a thing has changed (the body which contains it having been moved), then its proper place (or simply its place) has changed per accidens. This is not to say that when a body is moved, its actual parts are not, in fact, in new proper places. On the contrary, these actual parts are in new actual places. But the point is that they are in these new proper places only by virtue of the fact that they are in a new common place (the place of the containing body which was moved per se). They are in the new common place only indirectly and it is because they are in the new common place

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[1] Par. 192.

that they are in the new proper places.[1]

241. In the same way, when a jar is moved, what is in the jar has changed its place only *per accidens*. Now, if the place of a thing is the space in which the thing is, when a jar is moved to a new place, what is contained by the jar is penetrated by the new space (place) just as much as the jar is, and therefore what is in the jar must be in the new (common) place *per se* or immediately, just as the jar is. Being equally penetrated by the dimensions of the new space, the original space in the jar is also in the new place *per se*. The space (place) in the jar, then, has changed place *per se*. As we have pointed out, this is incredible. Therefore, place cannot be a space such as we have described.

242. When Aristotle has shown that the place of a thing can be neither the form of the thing nor a separable space in which it is, he shows that it cannot be the matter of the thing. First he gives the reason why place seems to be the matter of the thing. This is what he says:

> The matter, too, might seem to be place, at least if we consider it in what is at rest and is thus separate but in continuity. For just as in change of quality there is something which was formerly black and is now white, or formerly soft and now hard - this is just why we say that the matter exists - so place, because it presents a similar phenomenon, is thought to exist - only in the one case we say so because *what* was air is now water, in the other because *where* air formerly was there is

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[1] Since place has not been defined yet, one must not demand too great a precision at this stage. What has been said here should become more clear later on.

now water.[1]

Matter is like place in that both remain or are permanent in some changes. For instance, it is the same place which formerly contained air but now contains water. But we have a sign that they are different from the fact that we way that matter is <u>what</u> was black and is now white, whereas we say that the place is <u>where</u> one thing is but another was.

243. Second, he proves that place cannot be the matter of what is in place.

> But the matter, as we said before, is neither separable from the thing, nor contains it, whereas place has both characteristics.[2]

There does not seem to be any need for an explanation of this argument.

244. Next, Aristotle says:

> Well, then, if place is none of the three - neither the form nor the matter nor an extension which is always there, different from, and over and above, the extension of the thing which is displaced - place necessarily is the one of the four which is left, namely, the boundary of the containing body (at which it is in contact with the contained body). (By the contained body is meant what can be moved by way of locomotion.)[3]

It will be recalled that previously[4] Aristotle listed the four things place might be. They were the form of what is

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[1] Aristotle, IV <u>Physics</u>, Ch. IV, 211b30.

[2] <u>Ibid</u>., 211b36.

[3] <u>Ibid</u>., 212a3. The words "at which...contained body" are not found in Moerbeke's or Bekker's manuscripts but according to Ross they are preserved in the Arabo-Latin translation and by Themistius, Philiponus and Simplicius. We might remark that if they do not belong to the text, they must be understood.

[4] Par. 201.

in place, its matter, the separated space which it occupies and the inner surface of the containing body. Since the first three have now been eliminated, it follows that the genus of place must be the fourth of these, "the boundary of the containing body."

245. Having given the genus of place, Aristotle determines its difference. But in order to avoid a misunderstanding or error concerning this difference, he precedes it by the following remarks:

> Place is thought to be something important and hard to grasp, both because the matter and the shape present themselves along with it, and because the displacement of the body that is moved takes place in a stationary container, for it seems possible that there should be an interval which is other than the bodies which are moved. The air, too, which is thought to be incorporeal, contributes something to the belief: it is not only the boundaries of the vessel which seems to be place, but also what is between them, regarded as empty.[1]

It is very difficult to understand what place is. Matter and form seem to be associated with it (as is shown by the fact that place may be thought to be either one of them) and they are extremely difficult to understand. It is difficult for a further reason as well, for we have seen that place must be immobile. Otherwise a place will be in a place. We have shown above that it is extremely unlikely that place is a space, but on the other hand it seems that only space can be immobile, for we have seen that both the matter and

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[1] Aristotle, IV Physics, Ch. IV, 212a8.

the form are mobile, and the containing body is mobile also. One of the things which lends plausability to this belief is that air seemsincorporeal. Thus, where there is only air, it seems there is a space actually separated from all bodies. But as we have mentioned previously, Aristotle will take up this question later, when he considers the void.

246. It is easy to see that in answering this difficulty (i. e. that place must be immobile) we will, in fact, answer the argument given previously[1] to show that place must be a space for only space is immobile. And Aristotle does answer it, when he gives the difference of the definition of place. This is what he says:

> Just, in fact, as the vessel is transportable place, so place is a non-portable vessel. So when what is within a thing which is moved, is moved and changes its place, as a boat on a river, what contains plays the part of a vessel rather than that of place. Place on the other hand is rather what is motionless: so it is rather the whole river that is place, because as a whole it is motionless.[2]

Place is the boundary of the containing body, but it is a boundary of a particular sort. It is an immobile boundary. In order to support this view, Aristotle must show how there can be an immobile surface or boundary in a containing body which moves from place to place. In order to make clear what he means, Aristotle gives two examples. First, he says that if one thing is contained by another and the container

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[1] Par. 205.

[2] Aristotle, IV Physics, Ch. IV, 212a13.

moves, the container contains it like a vessel, not like a place, i. e. when a ship is moving down a river, the water containing the ship is mobile, and contains it as a mobile vessel contains what is in it.

247. On the other hand, let us suppose that the ship is anchored in the river. While the water flowing by the ship is not its place,[1] yet the ship seems to be in place in some way. In the first place, one can say that it is in the river taken as a whole as in its common place, i. e. the river as a whole is at rest,[2] and though it contains the ship, it contains other things also.

248. In the second place, as St. Thomas adds:

> But since the proper place is a part of the common place, one must take a proper place of the ship in the water of the river, insofar as it has an order to the whole river as it is immobile. Therefore, there is a place of the ship in the flowing water one (may) take, not according to this water which flows, but according to the order or position which this flowing water has to the whole river, which order or position, indeed, remains the same in the succeeding water. And therefore although the water materially flows by, nevertheless according as it has the nature (rationem) of place, namely according as it is considered in such an order and position to the whole river, it is not changed.[3]

We have seen that the ship anchored in the river is in the

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[1] "Et ideo, cum aliquid movetur in aliquo corpore quod movetur, sicut navis in flumine, utitur isto in quo movetur magis sicut vase, quam sicut loco continente: quia locus vult esse immobilis." St. Thomas, IV Physicorum, Lect. VI, n. 468(14).

[2] "...et propter hoc magis potest dici quod totus fluvius sit locus navis, quia totus fluvius est immobilis. Sic igitur fluvius totus inquantum est immobilis, est locus communis." Ibid.

[3] St. Thomas, IV Physicorum, Lect VI, n. 468(14).

river as a whole as in a common place. But we have seen previously that a thing is in its common place only per accidens, by virtue of something else, in which it is, and which in turn is in the common place.[1] It is in its common place only because it is in its proper place. Since, according to the example we are considering, the ship is in the river as a whole as in a common place, it follows that it must be in a proper place too. But what can one find that could be this proper place. The water is flowing by the ship. It seems that since the water touching the ship is in constant motion, the surface of the water touching the ship must be constantly other and other also. The surface of one part of the water is another surface from that of another part of the water. The two being different surfaces in number, when one surface is substituted for the other (as happens when the water flows by the ship), if place be supposed to be the surface of the container, the place does not remain one in number. It seems to follow, then, that the ship is not at rest, i. e. in a single place, because its place is constantly changing, i. e. now it is bounded by the surface of one part of the water, now by the surface of another. But this is against what we originally supposed, i. e. that the ship is at rest (at anchor).

249. The answer to this difficulty is precisely

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[1] Par. 192.

that proposed by St. Thomas above. For the unity of the surface of the water containing the ship can be understood in two ways. It can be understood to be one numerically insofar as it remains always the same surface of the same part of the water in number. In this sense, the surface of the water in contact with the ship is constantly changing and therefore in this sense it cannot be a place. But the surface can be understood to be one in another way also. For the surface of the water touching the ship remains one in order or position with reference to the river as a whole or the banks of the river despite the fact that the water is constantly flowing by and the surface is the surface of constantly changing parts of the water. This unity, which is one of position only, is the only one essential to place. It may happen that in some cases the surface which is place remains one in subject, i. e. that the surface which is one in position remains the surface of one subject also. But this is not necessary for the unity of the place as place.

250. Considering these things on a more general level now, we may say that the proper place of each thing is the internal surface of the containing body, this surface being immobile at least with reference to the universe as a whole (or with reference to the whole spherical body of the heavens for St. Thomas[1]) since at least the universe as

[1] "Et per hoc similiter accipere debemus quomodo extremitates corporum mobilium naturalium sint locus, per respectum ad totum corpus sphaericum caeli, quod habet fixionem et immobilitatem propter immobilitatem centri et polorum." St. Thomas, IV Physicorum, Lect VI, n. 468(14).

a whole must be immobile, for where could it go. Yet because we commonly find that those bodies to which the places of things belong (i. e. the bodies whose surfaces are places) are often being moved, it must be that the place of a thing at rest, while remaining one place, may belong to one body now, another later (the surface may have this water for its subject now, that water for its subject later). St. Thomas manifests the relation of place to its subject by comparing it with the relation of fire to its matter. For as the same fire is said to remain one with respect to its form, though the wood is constantly being consumed and new wood added, so a place remains immobile, though that body which is the subject of the surface which is the place does not remain one in number.[1]

251. From these things it is plain that the mobility of the various containing bodies does not prohibet the places of things from being both the surfaces of these containers and immobile at the same time. Therefore, since we have shown that we must not propose place to be a space if there is anything else place can be, we must join Aristotle when he says:

> Hence we conclude that the innermost motionless boundary of what contains is place.[2]

This is the definition of place.

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[1] St. Thomas, IV Physicorum, Lect. VI, n. 468(14).
[2] Aristotle, IV Physics, Ch. IV, 212a20.

252. Next, Aristotle confirms this definition by giving three things which have been said about place and which are suitable to it according to this definition. This is the first one he gives.

> This explains why the middle of the heavens and the surface which faces us of the rotating system are held to be 'up' and 'down' in the strict and fullest sense for all men: for the one is always at rest, while the inner side of the rotating body remains always coincident with itself. Hence since the light is what is naturally carried up, and the heavy what is carried down the boundary which contains in the direction of the middle of the universe, and the middle itself, are down, and that which contains in the direction of the outermost part of the universe, and the outermost part itself, are up.[1]

According to the definition of place which has just been given, those things which are at the center of the universe and those things which are in the heavens are in place because they have a definite and particular relationship to the universe as a whole (interpreting the universe as it appeared to a man at the time of Aristotle). But these places are seen to have an influence, for heavy bodies fall to the center of the universe (the earth), and the light bodies rise to the heavens. This, then, is a confirmation of our definition, for it was pointed out above that place is thought to have a certain influence.[2] Of course, we do not view the order of the parts of the universe in the same way Aristotle did, but this problem will be considered below.

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[1] Aristotle, IV Physics, Ch. IV, 212a21.

[2] Par. 140 and 187.

253. The second confirmation Aristotle gives is this.

> For this reason, too, place is thought to be a kind of surface and as it were a vessel, i. e. a container of a thing.[1]

One begins by thinking of the place of a thing as being a container like a vessel or the surface of a vessel is.[2] Later, because of the difficulties, one may be led to abandon this view. However, having defined place as has been done above, we can see the justification for this original view. Our definition is confirmed because it justifies our original view of what place is.

254. Finally, Aristotle gives this confirmation of the definition he has given.

> Further, place is coincident with the thing, for boundaries are coincident with the bounded.[3]

When we made the distinction above[4] between proper and common place and before we defined place, we referred to the fact that the proper place of a thing is equal to the thing. Having defined place as the innermost immobile surface of the containing body, this surface being perfectly in contact with what is within it because we have supposed the void does not exist, since it turns out that the proper

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[1] Aristotle, IV Physics, Ch. IV, 212a28.
[2] Par. 139 and 171.
[3] Aristotle, IV Physics, Ch. IV, 212a30.
[4] Par. 192-193.

place of a thing is equal to the thing, our definition is confirmed by our original knowledge of what place is like.

255. There are two difficulties which may be raised here. The first difficulty is this. In the passage we cited above,[1] St. Thomas said "...the proper place is a part of the common place..." Yet, the surface which is, in fact, the place of the part is not a part of the surface which is the place of the whole. How can this remark of St. Thomas, then, be reconciled with place being a surface?

256. A second difficulty, one related to the first, is presented by Joseph Albo in expounding the ideas of his master Hasdai Crescas. This is what Albo writes in criticizing Aristotle.

> Furthermore it follows according to him that the place of the part is greater than the place of the whole. For if you remove part of the inside of a sphere, it will require a greater surface to bound it outside and inside than when it is solid. Besides, it would follow according to him that one and the same body will have many places differing in magnitude. For if you divide a body into parts, each of the latter will require a greater place than before the division and the same is true if you divide the parts into other parts, and these again into parts. But this is contrary to the statement of Euclid in his book Concerning the Heavy and the Light, where he says that equal bodies occupy equal places. But according to the Aristotelian hypothesis this is not true. For of two equal bodies the one that is divided will require a greater place than the other. All these difficulties follow from the opinion that place is an external bounding surface.[2]

257. We will consider Joseph Albo's difficulty

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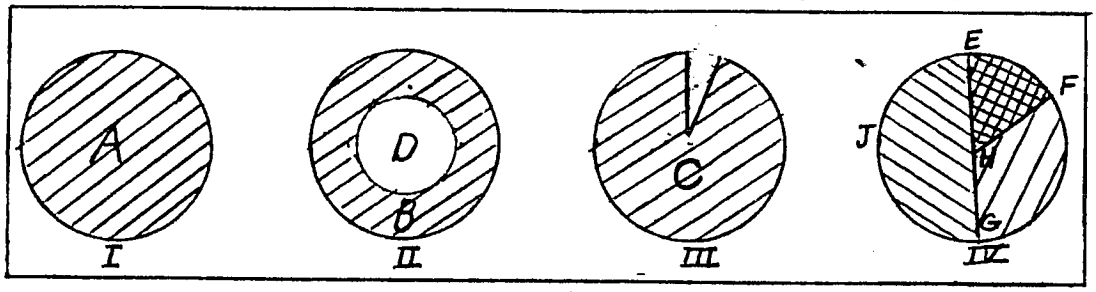
[1] Par. 248.

[2] Joseph Albo, Sefer Ha' Ikkarum, p. 106. Cited by Max Jammer, Concepts of Space (Harvard University Press, 1954), p. 76.

first. The first part of the argument can be understood in two ways. A is a sphere in some place, which place [1]



according to Aristotle is the bounding surface. B and C represent this body with different parts removed according to the different ways in which Albo can be understood, (1) the center removed from B and 2) a part extending from the exterior surface to the center removed from C. Now, according to the way in which one understands Albo, the surfaces bounding B (both interior and exterior surfaces added together) are greater than the surfaces bounding A, or the surface of C, which is a part of A is greater than the surface of A. Therefore, the place (surface) of the part (either B or C) is greater than the surface of the whole (A). In albo's view, it is impossible for the place of a part to be greater than the place of the whole. Therefore, place cannot be a bounding surface.

258. We will consider the case of B first. About this we must note that the exterior surface of D (which is supposed to be contiguous with the inner surface of B) is

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[1] We have represented the bodies as plane figures for the sake of simplicity.

not the place of B, or even a part of the place of B. For place was defined as the immobile inner surface of the containing body. D does not contain B, but rather is contained by B.[1] Thus, the place of B is no larger when D has been divided from it. From this it would seem that Albo did not read Aristotle very carefully if B is the kind of part to which he is referring. Actually, the inner surface of B is now the proper place of D. Further, what was before the proper place of the whole BD (as in A), remains the place of D when D has been divided from B, but the original proper place of the two together becomes the common place of D while remaining the proper place of B. It is not amazing if what was the proper place of the whole BD becomes the proper place of B, but remains the common place of D. Thus, we can see that if Albo's argument is understood to be referring to a part such as B, it is not a valid objection to the position of Aristotle.

259. Now let us consider the other interpretation. If a part of the body A is divided from A so that the resulting part is like C, it seems that the surface of the body (represented in the diagram by the bounding line) is greater than it was originally. Therefore, it seems that the place (the surface of the container contiguous with the surface of the body contained) of a part is greater than

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[1] St. Thomas, IV Physicorum, Lect. VII, n. 476(5).

that of the whole. According to this understanding of the argument (as well as according to the preceding understanding of it), the argument proceeds from a misunderstanding of what is meant by the equality or inequality of places. One has no doubt that the place of A is greater than the place of C. Why is this? It is precisely because one knows that the place of A contains more than the place of C. Aristotle himself says that the place of a thing is equal to the thing.[1] Yet he defines place as a surface. Does this mean that the surface of a thing is equal to the body which it contains? That makes no sense. Does it mean that the place (containing surface) of a thing is equal to the surface of the contained thing which surface is contiguous with the place? While it is true that the area of the surface of the container is equal to the surface of what is contained, this is certainly not what is meant, for then this property of place could be known only after the definition of place has been given, since it could be imagined to be a property of place only if place were known to be exactly what Aristotle defined it to be. What is meant by the equality of a place to what is in it is merely that the proper place of a thing contains neither more nor less than that thing. The equality of a place to what is in it

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[1]Par. 192.

refers to the equality of the capacity of the place to what is contained by it for Aristotle. A thing must totally exhaust the capacity of its proper place. Viewed in this way, it is easy to see that A has a greater place than C, even though the surface of C has a greater area, for though the area of the surface containing C is greater, its capacity is less. If the place of a thing were considered to be the space which contains it, the capacity of the container could be measured precisely by measuring the extension which was the place itself. This is not true for place as defined by Aristotle and in this case what determines its size is something distinct from the extension (or area) of the place itself, namely the capacity of the place, which is determined both by the extension of the place itself (the size of the surface) and by the way in which the parts of this place are arranged.

260. We have thus far seen that the first argument of Albo is of no value according to either interpretation of it.

261. The second argument given by him above is that equal bodies do not have equal places, if the definition Aristotle has given above is correct. Consider I and IV in the diagram given above. Let us suppose that the body I is equal to the whole of body IV. The surface bounding body A is equal to the bounding surface EFGJ of IV. But

now, suppose that body IV is divided into the parts EFH, FGH, and GJEH. The bounding surface of IV, then, consists of EFGJ, plus EH, FH and GH. Evidently, this is greater than EFGJ alone. It follows, then, according to the argument, that the place (bounding surface) of IV is not always the same size, but sometimes is smaller (when IV is undivided as A is) and sometimes is greater (when it is divided into parts). Therefore, the argument concludes, if the place of a thing is a surface bounding it, the places of equal bodies are not equal. Since this is impossible, Aristotle's definition must be incorrect.

262. The answer to this argument is found in the answers which have been given to the two ways of interpreting Albo's previous argument. On the one hand, two equal bodies have equal places even if one of these bodies is divided and the other is not. It is the proper place of the undivided body which is the common place of the parts of a body when the body is divided in act. Obviously, there is nothing in act in a body divided in potency corresponding to the places of the parts of a body divided in act. On the other hand, the sum of the capacities of the places of the parts of the divided whole is obviously equal to the capacity of the place of the same whole when undivided. We may conclude, then, that neither of the argument of Joseph Albo have any validity.

263. We can see now the answer to the first objection raised above.[1] St. Thomas says that "...the proper place is a part of the common place..."[2] But we have seen place to be a containing surface. Surely the surface containing the part is not part of the surface containing the whole. How are we to resolve this apparent contradiction?

264. From what we have already said, it is plain how this remark of St. Thomas is to be interpreted. For obviously in figure IV of our previous diagram, the places (containing surfaces) of the parts EFH, FGH and GJEH are not parts of the place (surface) of the whole EFGJ. What St. Thomas must mean is that the capacity of the proper place is included in the capacity of the common place. This is true, and contradicts nothing said above.

265. The arguments of Joseph Albo considered above were objections against the genus of place given in Aristotle's definition of place. There are also certain difficulties concerning the difference of place presented in the definition, i. e. immobile.

266. First, it seems that in the end Aristotle defined something quite other than what he originally wanted

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[1] Par. 255.
[2] Par. 248.

to define. His original intention was to define that to which and from which we commonly observe things to move. But those things to which and from which we commonly observe things to move are, in fact, mobile bodies, such as the earth to which a stone falls. Therefore, it seems Aristotle has not defined what he set out to define.

267. Second, while in Aristotle's universe the earth was considered immobile, in the universe as we know it today there is nothing at all, relative to which place could be immobile, for there are no immobile bodies. Therefore, it seems that Aristotle has defined something which does not exist.

268. These objections, which we have presented here in outline form, will be considered in detail at the end of this work. We mention them here only to inform the reader that they will be considered later.

269. When Aristotle has defined place and given the confirmations of it presented above, he shows how a thing may be in place simply and how in some respect. First he shows which things are in place simply.[1] This is what he says:

> If then a body has another body outside it and containing it, it is in place, and if not, not.[2]

From the definition of place which has been given, this seems

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[1] St. Thomas, IV Physicorum, Lect. VII, n. 472(1).
[2] Aristotle, IV Physics, Ch. V, 212a32.

relatively clear in general. However, St. Thomas points out a difficulty which arises because of this distinction.

> But this seems impossible because the ultimate sphere is moved in place. But nothing is moved in place which is not in place.[1]

The ultimate sphere of the universe, not having "another body outside it and containing it" is not in place. But according to the opinion of Aristotle, the outermost sphere is moved, i. e. rotated, and only what is in place can be moved (by local motion). It seems, therefore, that Aristotle's position is self-contradictory.

270. St. Thomas gives the opinion of Alexander, Avicenna, Avempace, and Averroes concerning this difficulty, showing in each case that the explanation proposed is unsatisfactory. Due to a lack of space and because the problem has become an historical one for us, since we no longer believe the universe to be bounded by a rotating sphere, we will not consider these numerous opinions and their refutations, though they are of considerable interest. However, we will present the solution of St. Thomas for the sake of completeness and principally because it will shed light upon the doctrine taught by Aristotle.

271. St. Thomas believes that the best solution to the objection is the one proposed by Themistius, who said that the ultimate sphere is in place through its

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[1] St. Thomas, IV Physicorum, Lect. VII, n. 474(3).

parts.[1] For a body need be in place only if it moves from place to place. Now, when a body is moved by rectilinear motion, it is plain that the whole body is moved, for the whole body leaves one place and goes to another. But in circular motion this is not the case, for the whole may remain bounded by the same surface while it rotates upon itself. The outer sphere of the heavens need not be in place as a whole, then, since rotation is the only motion it possesses. Hence no contradiction arises from its not being contained by anything, and therefore not being in place as a whole.

272. But there must be a certain local motion which belongs to the outer sphere for Aristotle because it rotates. While there is no motion of the whole sphere as such, since the whole does not change place, nevertheless, there is a local motion of the parts. For as the sphere rotates, where one part was, another part is now present. Thus the parts change place without the whole changing place.[2]

273. St. Thomas himself gives an objection to this solution.[3] For the parts of a continuum are not in place, as we have shown above.[4] Rather, it is the continuum

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[1] "Et ideo magis approbo sententiam Themistii, qui dixit quod ultima sphaera est in loco per suas partes." St. Thomas, IV Physicorum, Lect. VII, n. 478(7).

[2] Ibid.

[3] Ibid., n. 479(8).

[4] Ibid., Lect V, n. 452(8). See par 193-200.

as a whole that is in place and is moved. Since the ultimate sphere is a continuous body,[1] it seems to follow that its parts neither are in place nor are moved.

274. St. Thomas answers this objection as follows:

> But it must be said to this that the parts of the whole continuum, although they are not in place in act, nevertheless are in place in potency, according as the continuum is divisible. For the part, if it is divided, will be in the whole as in a place. Hence, in this way the parts of the continuum are moved in place. And this is most manifest in humid continua, which are easily divided, as in water, the parts of which are found to be moved within the whole water. Thus, therefore, because something is said of the whole by reason of the parts, insofar as the parts of the ultimate sphere are in place in potency, the whole ultimate sphere is in place <u>per accidens</u> by reason of the parts, and to be thus in place is sufficient for circular motion.[2]

Though the parts of a continuum are not in place in act, because they are not parts in act, yet these parts are potentially in place, for if they should be divided from each other in act, then they would be in place in act. In order to make more clear what is meant by a continuum being potentially divided he gives the example of water which is easily divided, the parts of which, when actually divided from each other, may have their own proper motions. According to St. Thomas, this potential divisibility of the ultimate sphere is sufficient to make it possible for a continuum to be in motion <u>per accidens</u>, by virtue of the motion of

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[1] St. Thomas, IV <u>Physicorum</u>, Lect. VII, n. 479(8).
[2] <u>Ibid</u>.

its parts.

275. In order to make this more clear, there are certain points which may be noted. First, it may be pointed out that if the outer sphere did not have actual parts in some sense, it could not move in act according to its parts. And in fact, the outer sphere, like every other continuum, does have actual parts in a sense, for just as what is toward one end of a line is not toward the other end of it, and what is in the middle is not at either end, so in the outer sphere, what is toward one part of the earth at any one time is not what is toward another part of the earth at the same time. These parts which a single continuum has in act are to be distinguished from the ones it has in potency only by the fact that those possessed in act are confused, i. e., there is no precise boundary delimiting one part from another. For instance, where does the middle of a line end and the part at the end begin? The exteriority of confused actual parts would seem to be the root of the divisibility of a continuum into distinct actual parts. St. Thomas then, by emphasizing the potential divisibility of the outer sphere (into actual distinct parts) in the passage cited above is indicating these actual confused parts of the outer sphere. It is these parts which are actually moving in the outer sphere, and because they are actual parts, the outer sphere can be actually moving in some sense.

276. Second, it may be pointed out that these actual parts, though they are moving according to local motion in some sense, are not in place according to the definition of place Aristotle has given, for the parts are not distinguished from one another by surfaces dividing one part from another and in this sense cannot be bounded by the surfaces of containers (the surfaces of the other parts). And of course there can be nothing outside the sphere to bound the parts on the outer side. Yet for Aristotle, as the sphere rotates, the relationship or position of each part to the earth is constantly changing, one part following another in succession, while the earth remains immobile. If one carefully considers this kind of motion, he can see why it is not necessary that there be actual places (as defined by Aristotle) for this exceptional case, since the whole is not moved as a whole and the parts, while actual in one sense, are not actual in another. Thus, they do not demand fully actual places to which and from which they move. Hence, the fact that this motion is not a motion according to place as Aristotle has defined it is not due to a defect in Aristotle's definition, but rather is due to the peculiarity of this motion, for there are no distinct mobiles going from one place to another, but only indistinct ones.

277. When Aristotle has shown what kind of things is in place simply and what kind is not, he shows how the

outer sphere is in place through its parts.[1] He says:

> That is why, even if there were to be water which had not a container, the parts of it, on the one hand, will be moved (for one part is contained in another), while, on the other hand, the whole will be moved in one sense, but not in another. For as a whole it does not simultaneously change its place, though it will be moved in a circle: for this place is the place of its parts. (Some things are moved, not up and down, but in a circle; others up and down, such things namely as admit of condensation and rarefaction.)[2]

Little explanation of this passage should be necessary in the light of our previous discussion. The outer sphere as a whole does not change place itself except in virtue of its parts, because it is moved only circularly, in contrast to those things which are moved as a whole from place to place by rectilinear motion and hence are in place as a whole. He uses the example of water because water is easily divisible, thus emphasising the divisibility of the outer sphere into parts.

278. Next, Aristotle explains how the parts of the outer sphere are in place.[3]

> As was explained, some things are potentially in place, others actually. So, when you have a homogeneous substance which is continuous, the parts are potentially in place: when the parts are separated, but in contact, like a heap, they are actually in place.[4]

This should be plain from the preceding also. The parts of the outer sphere are in place only potentially, because

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[1] St. Thomas, IV Physicorum, Lect. VII, n. 481(10).
[2] Aristotle, IV Physics, Ch. V, 212a32
[3] St. Thomas, IV Physicorum, Lect. VII, n. 483(12).
[4] Aristotle, IV Physics, Ch. V, 212b3.

they are distinctly divided one from another only potentially.

279. Next, in the light of what has been said, he shows how the whole outer sphere is in place.[1]

> Again, (1) some things are per se in place, namely every body which is movable either by way of locomotion or by way of increase is per se somewhere, but the heaven, as has been said, is not anywhere as a whole, not in any place, if at least, as we must suppose, no body contains it. On the line on which it is moved, its parts have place: for each is contiguous to the next.
> But (2) other things are in place indirectly, through something conjoined with them, as the soul and the heaven. The latter is in a way, in place, for all its parts are: for on the orb one part contains another.[2]

From the fact that the outer sphere does not move as a whole, we have seen[3] that it need not be in place as a whole, and from the definition of place we have seen that it cannot be in place per se. However, we have also seen that because the parts of the outer sphere are in motion they are potentially in place. Now Aristotle shows how the outer sphere is in place. He does this by distinguishing between the way in which a thing is in place per se from the way in which a thing is in place per accidens. A thing is in place per se if it itself is moved per se, either according to local motion or according to growth or diminution. The outer sphere is not moved in this way, as is clear from the

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[1] St. Thomas, IV Physicorum, Lect VII, n. 484(13).
[2] Aristotle, IV Physics, Ch. V, 212b7.
[3] Beginning at par. 269.

explanation given above. But the outer sphere is moved in another way, by virtue of its parts. These parts being in place the whole sphere is in place by virtue of them, per accidens.

280. One might note here that this is just the converse of what we said previously,[1] namely that the parts of a body which is moved from place to place are in place per accidens.[2] These two are equally true, but in different cases, of course.

281. Next, Aristotle draws a conclusion from what has been said.[3]

> That is why the upper part is moved in a circle, while the whole is not anywhere. For what is somewhere is itself something, and there must be alongside it some other thing wherein it is and which contains it. But alongside the All or the Whole there is nothing outside the All, and for this reason all things are in the heaven; for the heaven, we may say, is the All. Yet their place is not the same as the heaven. It is part of it, the innermost part of it, which is in contact with the movable body; and for this reason the earth is in water, and this in the air, and the air in the aether, and the aether in heaven, but we cannot go on and say that the heaven is in anything else.[4]

From the things we have said previously, this too should be relatively clear. The outer sphere is itself nowhere except per accidens) because it is not contained by anything,

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[1] Par. 190.

[2] "Et hoc accipit esse per accidens, scilicet per partes, sicut supra, cum dixit quod partes corporis moventur per accidens in loco." St. Thomas, IV Physicorum, Lect. VII, n. 484(13).

[3] Ibid., n. 485(14)

[4] Aristotle, IV Physics, Ch. V, 212b14.

the outer sphere itself not being the common place of things within it, but rather its innermost containing surface being their container or common place.

282. Having given his definition of place, confirmed it, and seen how various things are in place, Aristotle solves the doubts given about place which indicated that place does not exist. As St. Thomas points out,[1] Aristotle considers only four of the six difficulties presented in chapter one of book four. He omits the difficulties as to how place can be an element and how it can be a cause since, having defined place as he does, the difficulties lose their force. Place, though it exists, is neither a cause nor an element.

283. But there seems to be a difficulty in saying that place is not a cause. For St. Thomas, following Aristotle, seems to indicate here in IV Physicorum that place attracts as a final cause. In speaking of the influence of a natural place upon a body, St. Thomas says, "But it is not shown from this that place has an attractive virtue except as the end is said to attract."[2] He seems to make this even more clear elsewhere in this same book when explaining the various meanings of the word "in". For he says, "But then it is plain that appetite rests in the good desired

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[1] St. Thomas, IV Physicorum, Lect. VIII, n. 487(1).
[2] Ibid., Lect. I, n. 412(7).

and loved, and is made firm in it, as the placed in a place."[1] And in his commentary on the De Anima he has this to say:

> But some inclination follows from each form, and operation from inclination, as the inclination to the place which is up, according to which fire is called light, follows from the natural form of fire, and operation follows from this inclination, namely the motion which is upwards. Therefore, a certain inclination which is called sensitive or intellectual appetite follows on both a sensible and an intelligible form, just as the inclination following a natural form is called a natural appetite. But an operation follows from the appetite, which operation is local motion.[2]

Further, in his commentary on Aristotle's Metaphysics, St. Thomas also has something to say on the subject.

> ...For the good, according as it is the end of something is of two kinds. For there is an end extrinsic to that which is to the end, as when we say that a place is the end of that which is moved to the place. Also there is an end within, as the form, the end of generation and alteration, and the form already attained, are a certain intrinsic good of that to which the form belongs.[3]

From these remarks, it seems we must conclude St. Thomas' position to be that place is a final cause.

284. Further, in his The General Science of Nature, Vincent Smith's conclusion is as follows:

> It can surely be argued that in local motion, for example, in upward and downward motion with respect to the earth, we have to ascribe the outcome of the motion to chance or say that every body will do what is most suitable to its nature under the circumstances; in other words, it will behave in obedience to place as a

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[1] St. Thomas, IV Physicorum, Lect. IV, 436(3).

[2] St. Thomas, II De Anima, Lect. V, n. 286.

[3] St. Thomas, XII Metaphysicorum, Lect. XII, n. 2627.

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[1] St. Thomas, IV Physicorum, Lect. VIII, n. 487(1).
[2] Ibid., Lect. I, n. 412(7).

naturally rest), implying as it does that either there are some places naturally void or that some bodies have no natural places. Or one might try to resolve it by saying that place is not an intrinsic final cause, but only an extrinsic one, as is indicated by the citation from the Metaphysics above.

288. However, these solutions do not go deep enough. For place as defined here in the Physics is never a final cause, intrinsic or extrinsic. In order to understand this, two distinctions must be made. John of St. Thomas presents one of them as follows:

> "Place" physically and properly taken signifies that which is acquired by local motion. And it is customary to distinguish two kinds of place, one intrinsic, the other extrinsic. Extrinsic place is that body or surface by which the placed itself is circumscribed and contained. Intrinsic place is that passive presence itself of the placed thing, which is called "where".[1]

"Place", then, can refer to the containing surface or to what belongs under the category where. When we considered the category where we made it clear that to be somewhere is precisely to be in some place. Since place is a surface, it belongs to the category of quantity, whereas being in a place (where or intrinsic place for John of St. Thomas) is a separate category. Things belonging to separate categories are surely very different things.

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[1] John of St. Thomas, Cursus Philosophicus, II, q. 16, a. 1, p. 335.

289. Now, in V Physics[1] when distinguishing the various species of motion according to the categories in which their terms are found, Aristotle makes local motion the motion in the category where. Thus, if the term of local motion is a good, it must be that being in a place, not the place itself is that good.

290. However, this distinction is not sufficient, for it is difficult to see how being in a place (defined as immobile relative to the outer sphere) can be good for a body, even in the Aristotelian universe. But in a given case it may be good for one body to be surrounded by another particular body (for instance, a body may be less easily corrupted when surrounded by another of the same kind). The immobility of the containing surface relative to the entire universe would seem to be irrelevant. Thus, an additional distinction is necessary. A surrounding immobile surface is "place" taken formally, as it is defined here in the Physics. But a mobile, surrounding surface may be called "place" also. This is place taken materially, i. e., as a place may be said to remain one in number when the subject of the surface which is place remains one in number, regardless of the motion of this surface.

291. Now we can see what St. Thomas means when he

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[1] St. Thomas, V Physicorum, Lect. IV.

calls place a good or final cause. He must be referring to <u>being in a place</u> as place is taken materially. On the other hand, when he says that place is not a cause of any kind he is referring to place as it is taken formally. There is no conflict between these remarks. For the present, then, we may conclude with St. Thomas (and implicitly Aristotle) that place is not a cause.

292. This is the way St. Thomas presents Aristotle's refutation[1] of the sixth difficulty quoted above[2] concerning the existence of place, which is the first one Aristotle considers here.

> One of these was that since a place does not lack a body nor a body a place, it seemed to follow that when the body has grown, the place is increased.
> But this follows if it is supposed that place is a certain space coextensive with the dimensions of the body, that that space grows when the body grows. But this is not necessary according to the preceding definition of place, because it is the term of the container.[3]

From the definition of place that has been given, and its explanation, we can see that if a body grows, its place is not the same. Rather, it acquires a new and larger place, for the surface which is its place will be related to the universe as a whole in a new way, and therefore will be a new place. On the other hand, we can see that if place were imagined to be a space between the surfaces of a container

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[1] Aristotle, IV <u>Physics</u>, Ch. V, 212b23.
[2] Par. 163.
[3] St. Thomas, IV <u>Physicorum</u>, Lect. VIII, n. 488(2).

and determined by the container, when the container is expanded (consequent upon the growth of the contained body) the place (space) will be expanded also. Thus, this difficulty proceeds from incorrectly thinking that place is a space in the second sense of space which we considered above,[1] i. e. a space attached to the containing body.

293. The second difficulty Aristotle answers here[2] is the second one he gave above,[3] namely that if the place of a body is other than the body, the place of a point is other than the point. Because the place of a point cannot be other than the point (since its place would have to be a point and two points together are the same point), it seems to follow that the place of a body cannot be other than the body.

294. This argument also is a difficulty only if one imagines place to be a kind of separated space.[4] Then the bodies, surfaces, lines and points must have separated spatial bodies, surfaces, lines and points corresponding to them. But if one defines place as Aristotle has defined it, this is not the case. Indeed, place does exist, but being the surface of the surrounding body, it need not have

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[1] See the distinction presented in par. 206-211. See also par. 238-241.

[2] Aristotle, IV Physics, Ch. V, 212b24.

[3] Par. 155.

[4] St. Thomas, IV Physicorum, Lect VIII, n. 489(3).

dimensions coextensive with the body in it.

295. The third difficulty Aristotle resolves[1] is the first argument given above[2] to show that place does not exist. It was argued there that the place of a body must be a body since the place must have three dimensions. The body which is place must, then, interpenetrate with the body of which it is the place. Since two bodies cannot interpenetrate, place cannot exist.

296. Evidently, this argument also proceeds from the imagination of place as a space, which we now know Aristotle has denied. Therefore, the argument offers no difficulty concerning the existence of place as defined by Aristotle.

297. The fourth difficulty Aristotle considers here[3] is the argument of Zeno,[4] i. e. since everything which exists is in place, it follows that a place, if it exists, is in a place, and this place in another to infinity. Since this is impossible, place does not exist.

298. The answer to this difficulty is twofold. First, it is not necessary that everything be in place, but only that whatever is moved from place to place (or grows)

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[1]Aristotle, IV Physics, Ch. V, 212b25.
[2]Par. 154.
[3]Aristotle, IV Physics, Ch. V, 212b27.
[4]Par. 162.

be in place. Second, a place is indeed "in" something, but non in place. Rather, it is in the containing body, being a surface of that body.[1] Plainly, this is a more complete answer to the objection than the one given previously.[2]

299. Aristotle concludes his treatment of place taken universally by giving a reason for the properties of place taken from the definition of place, for he said above[3] that the definition of a thing ought to show that the properties of a thing really belong to it. He considers two properties of place, namely that things move to their places and that they rest there.[4] This is what he says about the first.

> Also it is reasonable that each kind of body should be carried to its own place. For a body is next in the series and in contact (not by compulsion) is akin, and bodies which are united do not affect each other, while those which are in contact interact on each other.[5]

According to the opinion of Aristotle, if things are in their proper places they are in the following order. Just under the heavenly spheres there is fire. Below it air is found. Below the air there is water. And at the bottom (or at the center of the universe) there is earth.

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[1] See the distinction between the various meanings of the word "in", par. 177.

[2] See par. 184

[3] Par. 188.

[4] St. Thomas, IV Physicorum, Lect VIII, n. 492(6).

[5] Aristotle, IV Physics, Ch. V, 212b29.

300. Two things may be noted about this order itself. In the first place, as St. Thomas points out,[1] this is an order from the more perfect to the less perfect. When a body is in its natural place, it is in contact with the kind of body most similar to it in perfection. For instance, the earth, which is just below the water and in contact with it, is one step below the water in perfection. The surface of the water, then, is the place of the earth. When the earth is in its natural place, it follows that it is in the place which is the surface of what is most similar to it in perfection. The order of the various kinds of things in the universe, then, is according to the order of the kinds of place[2] (e. g. watery for earth, airy for water), these places being more or less perfect according as their subjects are more or less perfect. For instance, the place of earth, having water for its subject, is inferior to the place of water, which has air for its subject, since air is more perfect than water.

301. In the second place, a similarity is found in the qualities of places and the bodies contained by them when the bodies are in their natural places. Thus fire, which is hot and dry, contains air, which is hot and wet. Air, which is hot and wet, contains water, which is cold

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[1] St. Thomas, IV Physicorum, Lect. VIII, n. 492(6).
[2] Taking "place" materially.

and wet. Water, which is cold and wet, contains earth, which is cold and dry. Thus, we may say that the place of a body is similar to the body contained by it when the body is in its natural place. This being the case, it will be less likely to be corrupted by its natural place than by some other place. For instance, when water is contained by air, it is less likely that one will corrupt the other than when the water is contained by fire. The natural places of things, then, are the places in which they are least likely to be corrupted.

302. However, this second consideration must be considered subordinate to the first (i. e. concerning perfection), for of the twenty four different ways in which the four elements can be ordered according to place from the outer sphere to the center of the universe, eight of them give the same sort of relationship among the qualities as the order proposed by Aristotle. For instance, water, which is cold and wet might be above air, which is hot and wet. Air, which is hot and wet might be above fire, which is hot and dry. Fire, which is hot and dry above earth, which is cold and dry. In addition to this last order and the one proposed by Aristotle, the other orders in which this sort of relationship is present are: 1) air, fire, earth and water, 2) air, water, earth and fire, 3) fire, earth, water and air, 4) water, earth, fire and air, 5) earth, fire, air and water and 6) earth, water, air and fire.

Because there are so many other equally satisfactory ways in which the elements may be ordered according to position by the similarity of the subject of a place to what is contained by it, this similarity must be secondary to the perfection of the elements in determining the order in which they are naturally found. Besides, this order by similarity of qualities in no way explains the position of the fifth element, which position demands explanation also. It would seem better if this explanation were given in the same terms as that of the other four elements.

303. Therefore, if place is defined as Aristotle has defined it, the explanation of the motions of bodies to their natural places may be said to involve place in some way. For it be granted that bodies naturally tend to attain an order among themselves according to their perfection, it follows that bodies naturally tend to their natural places, i. e. they naturally tend to an order of position such that the subject of the place of each body is the element immediately superior to it in nobility.[1] But no explanation of the natural motions of things can be found which in any way involves place if place is space.

304. Plainly, we cannot say that the universe appears to us to be organized in the way Aristotle thought.

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[1] St. Thomas, IV Physicorum, Lect. VIII, n. 492(6).

Hence, we find it impossible today to confirm this explanation of the natural motions of bodies. However, we will see more about this below.

305. Next, Aristotle gives the reason why a body rests in its natural place, in this way concluding his treatment of place in the Physics. This is what he says:

> Nor is it without reason that each should remain naturally in its proper place. For this part has the same relation to its place, as a separable part to its whole, as when one moves a part of water or air: so, too, air is related to water, for the one is like matter, the other form - water is the matter of air, air as it were the actuality of water, for water is potentially air, while air is potentially water, though in another way.
>
> These distinctions will be drawn more carefully later. On the present occasion it was necessary to refer to them: what has now been stated obscurely will then be made more clear. If the matter and the fulfilment are the same thing (for water is both, the one potentially, the other completely), water will be related to air in a way as part to whole. That is why these have contact: it is organic union when both become actually one.
>
> This concludes my account of place, both of its existence and of its nature.[1]

A body is in a place as a part is in a whole. But a part is naturally at rest in its whole. Therefore, since a body is naturally at rest in its whole, it is naturally at rest in its place. There are two steps to the argument Aristotle gives to show that a thing is in its place as a part is in its whole. First, he argues that a part is contained by its whole as a thing is contained by its place, with this

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[1] Aristotle, IV Physics, Ch. V, 212b34.

difference, a part is not actually divided from the whole to which it belongs whereas what is in place is actually divided from its place. Since a part naturally is at rest in its whole, a thing in place naturally rests in its place.

306. But two objections may be raised against this argument. First, a part is at rest in its whole precisely because it is not divided from its whole. Hence, from the fact that a part (which is not actually divided from its whole) is at rest in its whole, it cannot be argued that a thing must be at rest in its place (from which it is divided). Second, the argument Aristotle has presented "proves" too much, for according to the argument not only should a thing rest in its natural place as a part in a whole, but also a thing in a place by violence should rest there too, since it too is contained by its place as a part is contained by its whole, only separated from it.

307. Perhaps one can say that it is to avoid these objections that Aristotle gives an additional way in which a body is in its natural place as a part is in a whole. According to Aristotle, fire naturally contains air, which contains water, which contains earth, and of course all four are naturally contained by the fifth element. The containing element is more perfect than the contained element. Thus, when air is generated from water there is generation simply and corruption <u>secundum quid</u>, but when water is generated from air there is generation <u>secundum quid</u> and corruption

simply, for air is more perfect than water. But the perfect is related to the imperfect as form is related to matter. Thus, since form has the nature of whole, it seems that what is in its natural place is in its place as a part is in its whole.[1] But this is not true of what is in a place through violence, for then what is in place either is not informed (surrounded) by what is superior to it or its form (surrounding body) is not next to it in perfection and hence proportioned to it, as a form must be proportioned to its matter.

308. Since a part tends to be at rest relative to its whole, in the opinion of Aristotle a thing and its natural place should not be easily separable, because the subject of a natural place has the relation to what is naturally in it of whole to part. The root reason for this, again, is that what is in its natural place is contained by something more perfect than it (the contained) is.

309. About this argument, several things might be noted. First, Aristotle himself admits that it is rather obscure now, for those principles upon which it is based will be shown later. Thus, according to Aristotle it is not necessary to attain here a distinct knowledge of the principles upon which the argument is based.

310. Second, Aristotle does not propose this argument as a necessary one. By it he merely wishes to show that it

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[1] "Unde aer se habet ut forma et ut totum, quod habet rationem formae..." St. Thomas, IV Physicorum, Lect. VIII, n. 493(7).

is reasonable[1] in the light of the definition of place he has given for things to rest in their natural places. This cannot be said by those who propose place to be a space. If this opinion is held, there is no reason why a thing should rest in its natural place. Indeed, there could be no such thing as a natural place if place were a space, for place would have to be homogeneous.

311. Third, to attempt to justify it in terms of the more concrete analysis Aristotle makes later on would take us too far from our original task. Such an undertaking would involve a consideration of Aristotle's entire cosmology. Further, such an analysis is not extremely important to us here, because Aristotle's views concerning the order found in the universe have not been confirmed by modern observations. Therefore, we will let the argument stand as presented above.

312. Aristotle has now finished his treatment of place. But before we go on to consider Newton's space, it must be noted that there is a difficulty concerning Aristotle's treatment of place which was raised before[2] but which was not answered. This objection was that Aristotle ended by defining something other than what he originally wanted to define. For his original intention was to define that to which and from which we commonly observe things to move,

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[1] "Et dicit quod hoc accidit rationabiliter..." that things naturally rest in their places. St. Thomas, IV Physicorum, Lect. VIII, n. 493(7).

[2] Par. 266.