BOOK III
MOBILE BEING IN GENERAL

Lecture I

Need for defining motion and things related to it.

275. Having settled the question of the principles of natural things (Book I), and that of the principles of this science (Book II), the Philosopher here begins to pursue his original plan, which is to arrive at conclusions concerning the subject of this science, mobile being taken absolutely.

The treatment, then, is divided into two parts:

In the first he concludes with respect to motion in itself (Books III-VI);
In the second he concludes with respect to motion in relation to movers [things moving others] and things movable [things which others move] (Book VII).

The first part is divided into two:

He concludes in regard to motion itself (Books III-IV);
He concludes in regard to its parts (Book V).

As to the first, he does two things:

He states what is under investigation;
He follows it out, at 279.

With reference to the first of these, he does two things:

He states that concerning which he intends to treat principally;
He sets down certain things which adjoin thereto, with which he will be subsequently concerned, at 277.

276. As to the first [189] he uses the following argument: Nature is the principle of motion and change, as is evident from the definition set down in Book II. (But how motion and change differ, will be shown in Book V.) And thus it is evident that if one does not know motion, one does not know nature, since the former [motion] is placed in the definition of the latter [nature]. Since, therefore, we intend to present the science of nature, we must make motion understood.

277. Then [196] he adds certain things which accompany motion. And he employs two sets of reasons [for including them], the first of which is as follows [the second at no. 2778, below]:

Whoever determines something, must determine those things which follow upon it —for the subject and its accidents [Properties] are considered in a single science.

But the infinite follows upon motion intrinsically, as the following makes plain:

Motion is of the number of continuous things, as will be evident below in Book VI (l.6). But "infinite" enters into the definition of "**continuum.**"

And he [Aristotle] adds "first of all," because the infinite which is found in the addition of number, is caused from the infinite which is in the division of the continuum. And that the infinite enters [first of all] into the definition of the continuum, he shows from the fact that those defining the continuum often use "infinite"—as, for example, when they say that the "continuum" is that which is"divisible to infinity."

And he [Aristotle] says "often," since there is also found another definition of the continuum, which is given in the *Predicaments* [or *Categories*]: the "continuum" is that "whose parts are joined at a common boundary."

Now these two definitions differ. For the continuum, since it is a certain whole, is properly defined through its parts. But parts are compared to the whole in a twofold way, namely, as its components, i.e., according to composition, insofar as the whole is composed out of the parts; and as its resolutes, i.e., according to resolution, insofar as the whole is divided into the parts.

The present definition, therefore, of the contintium , is given according to the mode of resolution [division into parts]; while that which is set down in the *Predicaments* is according to the mode of composition [composition out of parts].

Hence it is clear that the infinite follows upon motion intrinsically.

But there are some things which follow upon motion extrinsically, as certain external measures: such as place, and the void, and time.

For time is the measure of motion itself; while the measure of the mobile thing is indeed place according to truth, but the void according to the opinion of some. And therefore he adds that motion cannot be without place, the void, and time.

Nor does the fact that not all motion is local affect this; since nothing is moved which is not in place. For every sensible body is in place, and to it [sensible body] alone does it belong to be moved.

Likewise, local motion is the first of motions, which, when it is removed, the other motions are removed, as will be evident below in Book VIII (l.14).

It is thus clear that the four above-mentioned properties are consequent upon motion; whence they pertain to the consideration of the natural philosopher for

the aforesaid reason.

278. This is also true for yet another reason which he [Aristotle] adds subsequently: namely, because the aforesaid are common to all natural things.

Accordingly, since it is the task of natural science to reach conclusions concerning all natural things, one must therefore first determine concerning each of these [four]. For the speculation which is directed toward proper things, comes after that which is of common things, as was stated in the beginning [Book I, l.1, no. 6]. But among all these common things, one must first reach conclusions concerning motion itself, because the other things follow upon it as was stated [in the preceding no].

279. Then [191] he puts his plan into execution:

> He reaches conclusions concerning motion, and the infinite, which follows motion intrinsically;
> He does the same for the other three, which follow moti§n extrinsically, and this he does in Book IV.

The first treatment is divided into two parts:

> He concludes with respect to motion;
> He does the same for the infinite, at 326.

With respect to the first of these, he does two things:

> He prefaces his treatment with certain considerations requisite for investigating the definition of motion;
> He defines motion, at 283.

As to the first of these, he does two things:

> He sets down in advance certain divisions, since the most suitable path towards finding definitions is through division, as is clear from the Philosopher in *Posterior Analytics* II (l.14 ff.), and in *Metaphysics* VII (l.12);
> He shows that motion falls within the aforesaid divisions, at 281.

280. With respect to the first of these, he sets down three divisions:

The first of these is that being is divided by potency and act. Now this division does not distinguish beings into genera—for potency and act are found in every genus.

The second division is of being as divided according to the ten genera: the first of these is "this something," i.e., substance; others are: how much [i.e., quantity], or how [quality], or some other of the Predicaments.

The third division is of one genus of beings, namely, of the one which is "to something" [relation]. For motion seems in a certain way to pertain to this genus, insofar as the mover is referred to the movable thing.

In order to understand this third division, one must consider that, since relation has the weakest existence—consisting alone, as it does, in the fact of being something referred to something else—it is necessary that it be grounded on some other accident. For the more perfect accidents are closer to the substance, and it is through them as intermediates that the other accidents inhere in the substance.

Now relation is founded chiefly upon two accidents which have an order to something else, namely, upon quantity and action. [or quantity may be a measure even of something external to it; while the agent transfuses its action into something other than itself.

Accordingly, certain relations are founded upon quantity; and especially upon that species of quantity which is number, to which the basic notion of measure pertains, as—is evident in "double and half," "multiple and submultiple [fraction]" and other such. Similarly, "same," "like," and "equal" are founded upon unity, which is the principle of number.

Still other relations are founded upon action and passion: either according to existing act [in the present], as something is said to be "heating" in relation to that which is heated; or according to "having acted" [in the past], as a father is referred to a son because he because he engendered him; or else according to the possibility of acting [in the future], as master is related to a servant because he is able to make him do something.

Now the Philosopher clearly explains this division in *Metaphysics* V (l.17); but he here touches on it briefly, saying that one sort of "to something" [relation] is that according to "excess and defect," which sort, indeed, is founded on quantity, as in the case of "double and half"; while the other is according to "active and passive," and "mover and movable," which are referred to each other, as is self-evident.

281. Then [192] he shows how motion is reduced to the aforesaid [three] divisions.

And as to this he does two things:

He shows that motion is not outside the genera of things in which motion occurs;
He shows that motion is divided as the genera of things are divided, at 282.

As to the first of these, it should be observed that since motion, as will be evident below (lesson following, nos. 285, 287; l.3, no. 296), is an imperfect act, and

since everything which is imperfect falls under the same genus with that which is perfect in respect to it—not, indeed, as a species, but by reduction (as prime matter is by reduction in the genus of "substance") necessarily motion is not outside the genera of things in which motion occurs. And this is what he [Aristotle] states, namely, that motion is not "outside of things," i.e., outside the genera of things in which motion is found, in such a way as to be something extraneous to, or something common to, these genera.

And he makes this plain by the fact that whatever is changed, is changed either according to substance, or quantity, or quality, or place, as will be shown in Book V.

Now there is not to be found in these genera some common univocal element which would not be found under some predicament but would be their genus; but being is common to them according to analogy, as will be shown in *Metaphysics* IV (l.1). Whence it is also plain that neither motion nor change is outside the aforesaid genera, since nothing is outside the latter and they sufficiently divide being. But, as to the question of how motion is related to the predicament of action or passion, this will be explained below (l.5).

282. Then [193] he shows that motion is divided as the genera of things are divided,

For it is plain that in all the genera a thing may be present in two ways, either as something perfect, or as something imperfect. The reason for this is that privation and possession is the prime contrariety, which is found in all the contraries, as is stated in *Metaphysics* X (l.6). Whence, since all the genera are divided through contrary differences, it is necessary that in all there be the perfect and the imperfect: as in "substance" something is as form and something is as privation; and in "quality" there is something such as white, which is perfect, and something such as black, which is, as it were, imperfect; and in "quantity" one thing is perfect quantity, another imperfect; and in "place" something is above, which is, as it were, perfect, and something is below, which is, so to speak, imperfect; or else there is light and heavy, which are placed in "where" [place] by virtue of the inclination [to a certain place] which is in them. Hence it is plain that according to the divisions of being, there are corresponding divisions of motion.

For the species of motion differ according to the different genera of being—as "increase," which is motion in quantity, differs from "generation," which is motion in substance.

The species of motion likewise differ according to perfect and imperfect in the same genus: for "generation" is motion in substance toward form, while "corruption" is motion toward privation; and in quantity, "increase" is toward

perfect quantity, "diminution" toward imperfect. But as to the question of why there are not assigned two kinds in quality and where [place], this will be explained in Book V (l.4).

Lecture 2

Definition of Motion

283. After first setting down certain things necessary for investigating the definition of motion, the Philosopher now defines motion:

In general;
More specifically, at 325.

With regard to the first, he does two things:

He shows what motion is;
He inquires whether motion belongs to the mover or to the mobile thing, at 299.

As to the first of these, he does three things:

He gives the definition of motion;
He explains the parts of the definition, at 287.
He shows that it is a good definition, at 291.

As to the first, he does two things:

He gives the definition of motion;
He gives examples, at 286.

284. As to the first, one must understand that some have defined motion by saying that motion is "a going-out from potency to act which is not sudden." But they are found to be in error, because they have placed in the definition certain elements that are posterior to motion: for a "going-out" is a species of motion; "sudden," likewise, involves time in its definition—the "sudden" is that which occurs in the indivisible of time [i.e., the instant]; time, however, is defined in terms of motion.

285. Consequently it is entirely impossible to define motion in terms of what is prior and better known otherwise than the Philosopher here does. For it has been pointed out already that every genus is divided by potency and act. Now potency and act, since they are among the first differences of being, are naturally prior to motion, and it is these that the Philosopher uses to define motion.

Consider, therefore, that something is in act only, something is in potency only, something else is midway between potency and act. What is in potency only is

not yet being moved; what is already in perfect act is not being moved but has already been moved. Consequently, that is being moved which is midway between pure potency and act, which is partly in potency and partly in act—as is evident in alteration. [or when water is only potentially hot, it is not being moved; when it has now been heated, the motion of heating is finished; but when it possesses " some heat, through imperfectly, then it is being moved—for whatever is being heated gradually acquires heat step by step. Therefore this imperfect act of heat existing in a heatable object is motion—not, indeed, by reason of what the heatable object has already become, but inasmuch as, being already in act, it has an order to a further act. For should this order to a further act be taken away, the act already present, however, imperfect, would be the term of motion and not motion itself—as happens when something becomes half-heated. This order to a further act belongs to the thing that is in potency to it.

Similarly, if the imperfect act were considered solely as ordered to a further act, under its aspect of potency, it would not have the nature of motion but of a principle of motion—for heating can begin from either a cold or a lukewarm object.

The imperfect act, therefore, has the character of motion both insofar as is compared, as potency, to a further act, and insofar as it is compared, as act, to something more imperfect.

Hence, motion is neither the potency of a thing existing in potency, nor the act of a thing in act, but it is the act of a thing in potency; where the word "act" designates its relation to a prior potency, and the words "of a thing in potency" designates its relation to a further act.

Whence the Philosopher most aptly defines motion as the *entelechy* , i.e., the act, of a thing existing in potency insofar as it is in potency.

286. Then [195] he gives examples from all the species of motion—as, for example, alteration is the act of the alterable insofar as it is alterable.

And because motion in quantity and in substance does not have a single name in the same way as motion in quality is called "alteration," he gives two different names for the motions in quantity, and says that the act of the increasable, and of its opposite, i.e., the decreasable, for which two there is no common name, is "increase" and "decrease." Similarly, the acts of the generable and of the corruptible are "generation" and "corruption"; and the act of what is mutable in regard to place is called "change of place."

In this section the Philosopher uses the word "motion" for any kind of change and avoids the strict usage in which "motion" is distinct from "generation" and "corruption," as will be said in Book V.

287. Then [196] he explains the several words of the definition:

He explains the use of the word "act";
He explains "of a thing existing in potency," at 288.
He explains "insofar as it is such," at 289.

As to the first he uses this reasoning. That by which something previously existing in potency becomes actual is an act. But something becomes actual when it is being moved, although previously it was in potency. Therefore motion is an act.

He says therefore that it is plain that motion is an act from the fact that the "buildable" implies a potency to something, but when the "buildable" according to this potency which it implies, is being reduced to act, we then say it is "being built"—and this act is "building" taken passively. And the same thing is true in all other motions such as indoctrination, healing, rolling, jumping, youth (i.e., increase),old age (i.e., decrease).

For it must be remembered that before something is being moved it is in potency to two acts: to a perfect act which is the term of the motion, and to an imperfect act which is motion itself. Thus water, before it begins to be heated, is in potency to being heated and to having been heated: when it is being heated it is being reduced to the imperfect act which is motion but not yet to perfect act which is the term of the motion—rather, in respect to this it still remains in potency.

288. Then [1977 he shows that motion is the act "of a thing existing in potency."

For every act is strictly the act of that in which it is always found—as light is never found but in the transparent, for which reason it is the act of the transparent. But motion is found always in a thing existing in potency. Therefore, motion is the act of a thing existing in potency.

To explain the second proposition he says that, since certain same things are both in potency and in act, although not at the same time, nor in the same respect—as, for example, something is hot actually and cold potentially it follows that many things mutually act and are acted upon insofar, namely, as both are in potency and in act with respect to the other under different aspects. And because all lower natural bodies share the same matter, there is therefore in each of them a potency to what is actual in another. Hence, in all such bodies something simultaneously acts and is acted upon, both moves and is moved.

This fact had led some to say absolutely that every mover is likewise being moved. This point will be cleared up in a later place. For it will be shown in *Physics* VIII (l.9 ff.) and in *Metaphysics* XII (l.7) that there exists an immobile mover, since it is not in potency but in act only.

But when that which is in potency, yet existing in a certain way in act, either acts itself or is acted upon by another so far as it is movable, i.e., is reduced to the act of motion, whether moved by itself or by another, at such time motion is its act. That is why things in potency, whether they act or are acted upon, are moved, since when acting they are acted upon and when moving they are being moved—just as fire, when it acts on logs, it acted upon, insofar as it becomes more dense through smoke, flame being nothing more than smoke afire.

289. Then [198] he explains this part of the definition, "insofar as it is such":

By an example;
By giving a reason, at 290.

He says therefore first that the phrase, "insofar as it is such," had to be added, because what is in potency is at the same time something in act. And although the subject which is both in potency and in act may be the same, nevertheless to be in potency and to be in act is not contained under the same notion. Thus, although brass is a statue in potency but is brass actually, nevertheless the notion of the brass as brass is not the same as the notion of the brass as it is in potency to a statue. Now motion is not an act of the brass insofar as it is brass but insofar as it is in potency to a statue; otherwise. during the whole time that it was brass it would be undergoing motion, which is clearly false. That is why it is necessary to add "insofar as it is such.

290. Then [199] he explains the same thing by using an argument based on the nature of contraries. For it is clear that a given subject is in potency to contraries —as a humor or the blood is in potency to health and to sickness. But to be in potency to health is one thing and to be in potency to sickness is another, if one considers their objects. Otherwise, if to be able to be sick and to be able to be well were the same thing, it then would follow that being sick and being well would be the same. Hence to be able to be sick and to be able to be healthy are different notions, although their actual subject is one and the same thing.

It is plain, therefore, that there is not one and the same notion of the subject as it is a certain being, and as it is in potency to something else. Otherwise, potency to contrary things would fall under one and the same notion. In like manner, the notion of that which is "color" and that which is "visible" are not one and the same.

Thus it was necessary to say that motion is the act of the possible "insofar as it is possible"—to prevent supposing that it is the act of what is in potency insofar as it is merely some subject.

Lecture 3

Justification of the definition of motion

291. Having given the definition of motion and an explanation of each of the words in the definition, the Philosopher now shows it to be a good definition:

Directly;
Indirectly, at 293.

292. In regard to the first [200] he uses the following argument: Everything which is in potency may at some time be in act; butt he "buildable" is in potency. Therefore, there may . at some time be an act of the "buildable" insofar as it is buildable.

But this act is either the house itself or the building of it. But "house" is not the act of the "buildable" insofar as it is "buildable." Since the "buildable" as such is being reduced into act when the building is taking place, but when the house now exists, it is no longer being built. Hence, building is an act of the buildable as such. Building, however, is a certain motion. Motion, therefore, is the act of a thing existing in potency as such. The same is true of other motions.

It is clear, therefore, that motion is the type of act above-described, and that something is being moved only when it is in such an act, and neither before nor after—not before, since if it is only in potency the motion has not begun; nor after, since it has now completely ceased to be in potency, by virtue of being in perfect act.

293. Then [201] he shows indirectly that it is a good definition by showing that motion cannot be defined in any other way. In regard to this he does three things:

He proposes what he intends;
He presents definitions given by others and rejects them, at 294.
He explains why others defined motion as they did, at 295.

He says therefore that two things show why the definition given of motion is a good one:

First, because the definitions that others have given are unsuitable;

Secondly, because it is impossible to define motion otherwise than as Aristotle has defined it, the reason being that motion cannot be placed in any other genus but that of "act of a thing existing in potency."

294. Then [202] he excludes the definitions of motion given by others. These followed a three-fold course in their definitions. For they said that motion is "otherness," because the thing being moved constantly changes from one state to another. Similarly, they said motion is "unequalness," because the thing being moved approaches its term always more and more. They also said that motion is "non-being," because the thing being moved does not yet have that to which it is

being moved as long as it is being moved—as that which is being moved toward whiteness is not yet white.

These definitions the Philosopher destroys in three ways.

He does so first by looking at the subject of motion. For if motion were "otherness" or "unequalness" or"non-being," then whatever would possess any one of these three characteristics would of necessity be undergoing motion—in whatever this motion is, that thing is being moved. But things that are other are not necessarily being moved by the fact that they are "other," nor by the fact that they are "unequal," nor by the fact that they "do not exist." It follows, therefore, that otherness and unequalness and non-being are not motion.

Secondly, he shows the same thing by looking at the term to which the motion is tending for motion and change do not tend more to "otherness" than to "likeness," or to "unequalness" more than to "equality," or to "non-being" more than to "being." For generation is a change to "being", and corruption to "non-being." Hence motion is not "otherness" any more than "a likeness," "unequalness" any more than "equalness," "non-being"any more than "being."

Thirdly, he shows the same thing by looking at the term from which the motion begins since just as some motions start from otherness and from unequalness and from non-being, so others start from their opposites. Hence there is no reason to place motion in the afore-mentioned genera any more than in their opposites.

295. Then [203] he points out why some defined motion in the aforesaid ways. In regard to this he does two things:

First he assigns the reason of what has already been stated.
Secondly, he explains a supposition he had made, at 296.

He says therefore that the reason why the older philosophers placed motion in the above-mentioned genera (namely, "otherness," "unequalness" and "non-being") is that motion seems to be something indeterminate, i.e., something incomplete and imperfect as though possessing no determinate nature. And because it is indeterminate, its proper place seemed to be in the genus of privation. For when Pythagoras laid down two ordinations of reality, in each of which he placed ten principles, the principles in the second group were said by him to be indeterminate because they were privative. They were not, indeed, determined by a form in the genus of substance, nor by the form of quality, or by any special form in either of these genera or by the form of any of the other predicaments.

In one of these groups the Pythagoreans placed ten things: finite, unequal, one, right, male, rest, straight, light, good, equilateral triangle; in the other they placed: infinite, equal, many, left, female, motion, oblique, dark, evil and scalene

triangle.

296. Then [204] he gives the reason why motion is placed among the indeterminates. And he says that the reason for this is that motion cannot be placed either in potency or in act. For if it were placed under potency, whatever would be in potency, for example, to quantity, would be being moved according to quantity. If, on the other hand, it were included under act, then whatever things were actually quantified would be being moved according to quantity.

Now it is indeed true that motion is act, yet it is imperfect act, a medium between potency and act. And that it is imperfect act is clear from the fact that that of which it is an act is a being in potency as stated above (I.2, no.285). And that is why it is difficult to grasp what motion is. For at first sight It seems to be either entirely act or entirely potency or else to be contained under privation as it seemed to the ancients who called it "non-being" or "unequalness." But none of these is possible, as we have shown above (no.294). Hence it follows that there is just one way to define motion; namely, that it is the kind of act we have said, i. e., that of a thing existing in potency.

It is difficult to dwell on such an act on account of the commingling of act and potency; yet that there should be such an act is not impossible,.but contingent.

Lecture 4

Action and passion are the same motion

297. After defining motion, the Philosopher now shows whose act motion is, i.e., whether it is the act of the mobile or of the mover. Also it may be said that he gives another definition of notion which is related to the previous one as material to formal and as a conclusion to its principle. And this is the definition: motion is "the act of the mobile inasmuch as it is mobile." This definition is a conclusion from the previous one. For since motion is "the act of a thing existing in potency inasmuch as it is in potence," and since that which exists in potency as such is the mobile and not the mover (for the mover as such is in act), it follows that motion is an act of the mobile as such.

298. In regard to the main question he does three things:

First he shows that motion is an act of the mobile;
Secondly, he shows how motion is related to the mover, at 303;
Thirdly, he raises a difficulty, at 308.

About the first he does two things:

He posits a definition of motion, namely, that motion is an act of the mobile;
He clears up a doubt, at 303.

In regard to (1) he does three things:

He investigates the definition of motion:
He concludes to the definition, at 302;
He explains it, at 302 bis.

In investigating the definition he shows that "to be moved" even occurs to the mover. In regard to this he does two things:

He shows that every mover is being moved;
He shows why that happens, at 301.

299. He shows in two ways that the mover is moved. This is so first of all because anything that is previously in potency and then in act is somehow being moved. But movers are found that are previously movers in potency and afterwards movers in act; therefore they are moved. He states, therefore, that every mover, since it is such that it is in potency to being a mover, is likewise moved. This is clear from what has been already said, for it was said that motion is an act of a thing existing in potency and this occurs in every natural mover; that is why it was said above that every physical mover is moved.

300. Secondly [206] he brings out the same point in another way: Whatsoever's immobility is its rest is capable of motion; for rest and motion, since they are opposites, happen to the same. But the immobility of a mover, i.e., its ceasing from moving, is called rest; for there are things which said to rest when they cease to act. Therefore every such mover, i.e., one whose immobility is rest, is moved.

301. Then [207] he shows why it happens that a mover is moved. For it does not happen precisely because it is a mover but because it is such by touching; because to move is to act in order to cause something to be moved and what is so acted upon by the mover is moved. But whatever acts does so by touching, for bodies act by touching; hence it follows that what acts is at the same time acted upon, because that which touches is acted upon. However, this must be understood of those cases where there is mutual touching; namely, when the thing touching is also touched, as happens in things which are material, where both of the things are acted upon when they touch one another. But heavenly bodies, because they do not have material like the lower bodies, so act on them that they are not acted upon in return and they touch without being touched as is stated in *De Generatione* I (l.18).

302. Then [208] he posits a definition of motion concluding from the aforesaid that although the mover is moved, motion nevertheless is not an act of the mover but of the mobile inasmuch as it is mobile. He shows this subsequently by the fact that "to be moved" is accidental to the mover and does not belong essentially to it. Whence, if something is moved precisely inasmuch as its act is

motion it follows that motion is an act not of the mover but of the mobile, not, indeed, insofar as it is a mover but insofar as it is a mobile.

That "to be moved" is accidental to the mover is clear from what was pointed out in the earlier part of this lecture; for the act of the mobile which is motion happens from its contact with the mover; from which it follows that at the same time that it is acting it is acted upon and thus "to be moved" is accidental to the mover.

That "to be moved" does not belong essentially to the mover is clear from the fact that some form is always seen to be the mover—as the form which is in the genus of substance is the mover in substantial change, and a form in the genus of quality is the mover in alteration, and a form in the genus of quantity in growth and decrease. Forms of this type are the causes and principles of motions, since every agent moves according to its form. For every agent acts inasmuch it is actual—as an actual man makes an actual man of man in potency. Hence, since it is through its form that a thing is actual it follows that form is the moving principle. Thus "to move" belongs to a thing inasmuch as it has a form through which it is actual. Wherefore, since motion. is the act of a thing existing in potency, as said above (l.2, no.285), it follows that motion belongs to a thing not insofar as it is a mover but insofar as it is mobile. For that reason the definition says that motion is an act of the mobile inasmuch as it is mobile.

303. Then [209] he shows a difficulty that arises from the aforesaid. For some wonder whether motion is in the mover or in the mobile. But this doubt is solved from what went before. For it is clear that an act of anything is in that thing of which it is the act. Thus, it is plain that the act of motion is in the mobile, since it is an act of the mobile, although caused in it by the mover.

304. Then [2167 he shows how motion and mover are related. And first of all he proposes his intention, saying that the act of the mover is not distinct from the act of the mobile. Hence since motion is an act of the mobile it is somehow also an act of the mover.

305. Secondly [211] he explains this. And in regard to this he does three things. First he shows that there is an act of the mover as well as of the mobile. For whatever is described according to potency and act has some act competent to it. Now just as that which is moved is called "mobile" in potency since it is capable of being moved, and is called "moved" according to act inasmuch it is actually being moved, so on the part of the mover, a mover is described "potential mover" inasmuch as it is able to move, and "moves" in the act inasmuch as it actually acts. Therefore some act is competent to both, i.e., to mover and to mobile.

306. Secondly [212] he shows that the act of the mover and of the mobile is the same act. For something is called "mover" inasmuch as it acts and "moved"

inasmuch as it is being acted upon. But what the mover causes by acting and what the moved receives is being acted upon are one and the same. thing. And this is what he means when he says that the mover actualizes the mobile, i.e., causes the act of the mobile. Wherefore, they must both, namely, mover and moved, have the same act; for what is from the mover as agent cause is the same as what is in the moved as patient and receiver.

307. Thirdly [213] he illustrates this by an example. For the distance from one to two is the same as that from two to one, but they differ according to conception; for in relating two to one we have "double," but in relating one to two we have "one-half." The same thing is true of the distance covered by one ascending and by one descending, but by reason of the diversity of starting point and term, one is called "ascent" and one "descent." A parallel case is true of the mover and of the thing moved. For motion, inasmuch as it proceeds from the mover into the mobile, is an act of the mover, but inasmuch as it is in the mobile from the mover, it is an act of the mobile.

Lecture 5

Motion as from the agent and in the patient

308. After showing that motion is the act both of the mobile and of the mover, the Philosopher now raises a difficulty on this point.

First, he raises the difficulty:
Secondly, he solves it, at 314.

Regarding the first, he does two things:

First, he prefaces certain things to the difficulty;
Secondly, he builds up the difficulty, at 310.

309. He says therefore [214] that what has been said above now causes a "rational", i.e., logical, "defect," i.e., doubt—by virtue of there being probable reasons for both sides. In introducing the difficulty he says that there is an act in that which is active and there is an act in that which is passive, just as above (no. 305) there was stated to be an act of the mover and of the moved. As a matter of fact, the act of the active is called "action" and the act of the passive is called "passion". This he proves by saying that the work and end of anything is its act and perfection; hence, since the work and end of the agent is action and that of the patient is passion (or undergoing), it follows that action is the act of the agent and passion that of the patient.

310. Then [215] he develops this doubt. For it is clear that both action and passion are motion; for each is the same as motion. Therefore, action and passion are either the same motion or diverse motions. If they are diverse, then

each of them must be in some subject. Either both will be in the patient, i.e., the thing moved, or one of them (action) is in the agent and the other (passion) is in the patient. To say the opposite, i.e., that what is in the agent is passion and what is in the patient is action is to speak equivocally, or it would be calling passion action and vice vers.& The fourth possibility, namely, that both are in the agent is left out, but this is because it has already been shown (nos. 302-303) that motion is in the mobile, which excludes the fourth possibility that neither be in the patient but both in the agent.

311. Of the two possibilities listed, he develops the second one first [216]. For if anyone says that action is in the agent and passion in the patient, then since action is a certain motion, as was stated (no. 310), it follows that motion is in the mover. For the same thing should be true both of the mover and of the moved, namely, that if motion is in either one it is being moved. Or else, that is true of the mover and of the moved which is true of the patient and of the agent. Now, if motion is in something, that thing is being moved; wherefore, it follows that either every mover is being moved or that something has motion but is not being moved; each of these seems unreasonable.

312. Then [217] he develops the second possibility given in 310. He says that if anyone should say that both of them, namely, action and passion, since they are two motions, are in the patient, which is equivalent to saying that teaching which is on the part of the teacher and learning which is on the part of the learner are both in the learner, then two conflicts arise. The first is that if what we said previously is true, namely, that action is an act of the agent, then if action is not in the agent but in the patient, it will follow that the proper act of each thing is not in the thing of which it is the act.

Then another conflict follows, namely, that one and the same thing is being moved according to two motions. For action and passion are now supposed to be two motions. Now in whatever thing there is a motion that thing is being moved according to that motion; if then action and passion are in the mobile, it follows that the mobile is being moved according to two motions. This would be tantamount to having two alterations in one subject both of them specifically the same; for example, one subject being moved to two whitenings, which is impossible. This does not mean that one subject could not be moved by two alterations tending toward two specifically different terms, for example, whitening and heating. Nevertheless, it is clear that action and passion terminate at the same specific term; for what the agent does and what the patient receives are one and the same.

313. Then [218] he develops the other possibility. For it could be said that action and passion are not two motions but one. But this leads to four difficulties. The first is that the act of things of different species would be the same. For it has been already pointed out (no. 309) that action is an act of the agent and passion

ant act of the patient and that these are specifically diverse; but if action and passion are the same motion then the act of specifically different things will be the same. The second difficulty is that if action and passion are one motion, then action is the same as passion, so that teaching which is laid to the teacher is the same as learning which is in the learner. The third difficulty is that acting would be the same as being acted upon and teaching would be the same as learning. The fourth difficulty that follows from this is that every teacher would be learning and every agent would be being acted upon.

314. Then [2197] he solves the difficulty. From what was settled previously, (nos. 304,306) it is clear that action and passion are not two motions but one and the same motion; for insofar as motion is from the agent it is called "action," and insofar as it is in the patient it is called "passion."

315. Hence not all the conflicts which follow from the first case, in which it was supposed that action and passion are two motions, have to be solved. But one remains to be solved even on the supposition that action and passion are one motion: because since action is an act of the agent, then if action and passion are one motion, it follows that the act of the agent is somehow in the patient and thus the act of one thing will be in something else. This remaining difficulty together with the four listed in 313 leave five to be solved.

316. He says in the first place that there is nothing wrong with an act of one thing being in something else, for teaching is an act of the teacher, an act continuously tending from him into someone else without interruption; hence, this act which is the agent's as being "from which" is the very one which is in the patient as received in him. But it would be wrong if the act of the one were the act of the other in precisely the same way.

317. Then [220] he solves another difficulty; namely, that there would be one and the same act for two diverse things. And he says that there is nothing to prevent one act belonging to two things so long as it is not one and the same in aspect but only in reality, as was already explained above (no. 307) when it was pointed out that the distance from one to two and from two to one are the same; and of that which is in potency looking toward the agent and conversely. For in these cases the same one reality is assigned to two things according to different aspects: it is assigned to the agent inasmuch as it is from it and to the patient inasmuch as it is in it.

318. The three remaining difficulties of which one followed logically from the other he takes care of in reverse order. He disposes first of the last difficulty deduced, because it is so evidently improper. Thus he is now, thirdly, settling the fifth difficulty. He says that it is not necessary to say that one who is teaching is learning or that an agent is being acted upon just because to act and to be acted upon are the same, as long as we understand that they are not the same in the

way that dress and clothing are the same (for these are the same in motion) but in the way, as said above (nos. 307,318), that the road from Thebes to Athens and from Athens to Thebes are the same, i.e., as being the same as to subject but differing as to notion. For it is not necessary that things which are somehow the same should be the same in all ways; that is true only of things that are the same in subject or reality and also in motion. And therefore even granting that to act and to be acted upon are the same, yet since they are not the same in notion, it will not follow that it is the same for an object to act and to be acted upon.

319. Then [221] he answers the fourth difficulty. And he says that even though teaching and the doctrine of the learner were the same, it does not follow that to teach and to learn are the same; because teaching and doctrine are abstract terms, whereas to teach and to learn are concrete. Hence they are being applied to ends or to terms which serve as the basis for the difference in notion between action and passion. For just as the distance between two points is one and the same space in the abstract, yet if we apply it to two concrete places it is not one and the same, as when we say that there is a distance between here and there and between there and here.

320. Then [222] he answers the third difficulty by destroying the inference that if action and passion are one motion, they are the same. And he says it necessary to say finally that it does not follow that action and passion are the same or that teaching and learning are, but rather that the motion in which both are is the same. This motion as a matter of fact is action from one viewpoint and passion from another. For it is one thing as to notion to be an act of a thing as being in it and another to be the act of a thing as being from it. Now motion is called "action" inasmuch as it is an act of the agent as from the agent; it is called "passion" inasmuch as it is an act of the patient as in the patient. Thus it is clear that although the motion of the mover and of the moved is the same thing due to the fact that motion as such abstracts from these aspects, yet action and passion differ due to the fact that these aspects are included in their signification. From this it is also apparent that since motion abstracts from the notion of action and passion, it belongs neither in the predicament "action" nor in the predicament "passion," as some supposed.

321. But two difficulties still remain with respect to this. The first is this: if action and passion are one motion, and they differ merely in thought, as said above (no. 317), it seems that they should not be listed as two distinct predicaments, since the predicaments are genera of things. Secondly, if motion is either action or passion, motion will not be found in substance, quality, quantity, and place, as said above (no. 286), but only in action and passion.

322. To settle this matter it must be remembered that being is divided into the ten predicaments not univocally, as a genus into its species, but according to the

diverse manner of existing. Now the modes of existing are parallel to the modes of predicating. For in predicating something of something, we say that this is that; that is why the ten genera of being are called "predicaments."

Now every predication takes place in one of three ways. One way is to predicate of a subject that which pertains to its essence, as when I say "Socrates is man" or "Man is animal." According to this the predicament of "substance" is taken.

Another way is to predicate of a subject something that is not of its essence but yet inheres in the subject, This inherent thing may be traceable to the matter in the subject, in which case one has the predicament of "quantity" (for quantity is properly a result of matter; for which reason Plato traced the "large" to matter); or it is traceable to the form and in this case, there is the predicament of "quality" (for which reason qualities are founded on quality, as color in a surface, and figure in lines or in a plane); or the predication may be due to a relation existing between subject and something else and thus we have the predicament of "relation", (for when I say, "The man is a father," it is not something absolute that is predicated of the man but a relation in him to something without).

The third mode of predicating is when something outside the subject is predicated after the manner of denomination; this allows even extrinsic accidents to be predicated of substance; but yet we do not say that man is whiteness but that man is white. To be denominated by something extrinsic can occur, generally speaking, to all things in one way or another, and in a special way in those matters that refer only to man.

Speaking generally, a thing can be denominated by something extrinsic either according to the notion of cause or according to that of measure. For something is denominated "caused" or "measured" on account of its relationship to something extrinsic. Now there are four genera of causes, two of which are parts of the essence, namely, matter and form; hence any predication based on these two pertains to the predicament of "substance," as when I say that man is rational and man is corporeal. In regard to the other two causes, the final cause does not cause separately from the agent; for the end is a cause only insofar as it influences the agent. Therefore, the only cause according to which a thing can be denominated something as based on something extrinsic is the agent cause. Consequently, when something is denominated from the agent cause, it is the predicament of "passion," for to undergo (*pati*) is nothing but the undergoing of something from an agent; on the other hand, if the agent cause is denominated something on account of its effect, one has the predicament of "action," for action is an act from the agent into something else, as stated above (no, 316).

In regard to measures, it will be either intrinsic or extrinsic. An intrinsic measure would be a thing's own length and width and depth: in these cases a subject is

being denominated something by reason of what inheres intrinsically; hence this Pertains to the predicament quantity. The extrinsic measures are time and place. It is the predicament "when", whenever something is denominated by time; when it is denominated by place, it is the predicament "where" or the predicament "situs", which adds to "where" the order of the parts in place. Such an order of parts is not considered in regard to the measure which is time, for the order of parts in time in time is already implied in the notion of time; for time is the number of motion according to the order of the "before" and the "after" [its parts]. Thus it is through denomination from time or place that something is said to be "when" or "where".

There is a special predicament for men. For in other animals nature provided the requirements for preserving life, such as horns for defense, a tough and wooly hide as a covering, claws or the like for proceeding without harm. Hence, when by reason of this equipment animals are said to be "armed" or "covered" or "shod," they are somehow so called not by reason of something; extrinsic but of something intrinsic, which is part of them. Hence, such are referred to the predicament of "substance," as the same would be if man were said to be "endowed with hands" or "feet." But the other things could not be endowed upon man by nature, both because they would be out of keeping with the subtlety of his complexion and because reason makes man capable of an enormous number of works for the performance of which nature could not have endowed him with specific instruments. In the place of all these instruments man has reason, which he can use to make for himself the things that are intrinsic to other animals. So when a man is said to be armed or clothed or shod, he is denominated thus by reason of something extrinsic to him that is neither a cause nor a measure; hence it is located in a special predicament called "habitus." But we should not fail to note that this predicament is in certain matters used also for other animals not inasmuch as they are considered in their nature but insofar as they are put at the service of man: thus we that a horse is caparisoned or saddled or armed.

323. This makes it clear that although motion is one, yet there are two predicaments which are based on motion depending on the different external things according to which the predicamental denominations are made. For an agent is one thing from which as from something external the predicament of "passion" is taken; and the patient is some other thing from which something in denominated an agent. This solves the first difficulty (mentioned in 321).

324. The second doubt is easy to solve. For the idea of motion depends not only on that which pertains to motion in reality but also on that which reason apprehends. In reality, motion is nothing more than an imperfect act which is a sort of beginning of a perfect act in that which is being moved; thus, in that which is becoming white, some whiteness has begun to be. But in order that what is imperfect have the aspect of motion it is further required that we understand it as a medium between two: the preceding one of them is compared

to motion as potency to act (whence motion is called act); the consequent one is compared to motion as the perfect to the imperfect or as act to potency, wherefore motion is called "the act of a being that exists in potency," as we said above (no. 285). But anything imperfect, if it is not considered to be tending on to something other as perfect, is called the terminus of motion and one will not have a motion according to which something is being moved; as, for example, if something should start to become white and then the alteration was immediately stopped.

Therefore, in regard to what there is of motion in external reality, motion is placed reductively in that genus which terminates the motion, as the imperfect is reduced to the perfect, as stated above (no. 281). But in regard to what reason apprehends about motion, namely, that it is midway between two-terms, here the notion of cause and effect are brought in; because for something to be reduced from potency to act an agent cause is required. From this aspect, motion pertains to the predicaments of "action" and "passion"; for these two predicaments are based on the notions of acting cause and of effect, as was said above (no. 322).

325. Then [223] he defines motion more particularly. He says that we have pointed out what motion is both in general and in particular—because from what was said about the definition of motion in general is clear how it can be defined in particular. For if motion is the act of the mobile as such, it follows that alteration is the act of the, alterable as alterable, and so on for other particular kinds of motion.

And because there was a doubt whether motion is an act of the mover or of the mobile and we showed(no. 320) that it is an act of the active as from it and of the passive as in it, then to remove any further doubts we can say somewhat more explicitly that motion is an act of the potency of that which is active and of that which is passive.

In this way we could have said that building is an act of the "builder" and. of the "buildable as buildable"; the same is true of healing and of other motions.

LECTURE 6

Early opinions on the infinite

326. After settling motion, the Philosopher now begins to settle the infinite.

First he shows that natural science should settle the infinite;
Secondly, he begins to determine the infinite, at 336.

As to the first he does two things:

First he shows that it pertains to natural science to settle the infinite.
Secondly, he gives the opinions of the earlier philosophers concerning the infinite, at 329.

327. He proves the first point with an argument and a sign.

The argument is as follows: Natural science studies magnitudes and time and motion. But in such things the finite and infinite are necessarily found for every magnitude or motion or time is contained under one or the other, i.e., either the finite or the infinite. Therefore, it pertains ta natural science to consider the infinite, namely, as to whether it exists and as to what it is.

But because it could be objected that consideration of the infinite pertains to first philosophy, on account of its general character, he counters this by saying that not every being has to be either finite or infinite; for a point and a passion, i.e., passible [sensible] quality, are not contained under either, whereas the objects of consideration in first philosophy are things that follow upon being inasmuch as it is being and not upon some definite genus of being.

328. Then [225] he establishes the same point through a sign taken from tho. practice of the natural philosophers. For all who have treated this, namely, natural philosophy, according to reason, have mentioned the infinite. This fact is a probable argument, based on the authority of wise men, that it belongs to natural philosophy to settle the infinite.

329. Then [226] he gives the opinion of the earlier philosophers about the infinite.

First he shows in what they differ;
Secondly, he shows in what they all agreed, at 335.

As to the first he does two things:

First he gives the opinions on the infinite of those philosophers who were non-natural [i.e., disregarded sense], i.e., the Pythagoreans, and the Platonists;
Secondly, he gives the opinions of the natural philosophers, at 333.

As to the first he does two things:

First he dhows the points of agreement between the Pythagoreans and the Platonists;
Secondly, their points of disagreement, at 331.

330. He says therefore that while all the philosophers posited the infinite as a certain principle of things, only the Pythagoreans and Platonists asserted that the infinite is not something accidental to some nature but something existing of itself. This is not surprising, because it is in keeping with their claim that numbers and quantities are the substances of things. Now the infinite is found in quantity;

hence they posited that the infinite exists of itself.

331. Then [227] he shows the difference between Plato and the Pythagorean, first, as to the laying down of the infinite; secondly, as to the basis thereof (no. 332).

Regarding the laying down of the infinite, Plato differed in two respects from the Pythagoreans. For the Pythagoreans did not lay down an infinite except in sensible things. Since the infinite belongs to quantity, and the first quantity is number, the Pythagoreans, not laying down number to be separated from sensible things, but stating number to be, rather, the substance of sensible things, consequently did not lay down any infinite except in sensible things.

Likewise Pythagoras considered that the sensible beings which are within the confines of the heavens are circumscribed by the heavens—whence the infinite cannot be in them—hence he laid down that the infinite was in the sensible things outside the heavens,

But Plato by contrast laid down that nothing is outside the heavens. For neither did he say that there was outside the heavens any sensible body, since he maintained that the heavens contained all sensible things; nor did he say that the ideas and species of things, which he laid down as being separated, were outside the heavens, since "inside of" and "outside of" signify place, while the ideas, according to him, are not in any place, place being of corporeal things.

Plato likewise said that the infinite is not only in sensible things, but also in "them", i.e., the separated ideas, there being, even in the separated numbers something formal, such as unity, and something material, such as duality, out of which all numbers are composed.

332. Then [228] he shows the difference between them as to the basis of the infinite.

And he says that the Pythagoreans attributed the infinite to a basis which was "even number." And they demonstrated this in two ways. The first was an argument. That which is enclosed by another, and is terminated by another has the nature of the infinite; whereas that which encloses and terminated has the nature of a term. Now even number is comprehended and included under odd number. For if some even number is proposed, it is seen as in every way divisible. But when by the addition of unity it is reduced to an odd number, it now takes on a certain indivisibility, as though even was compressed under odd. Hence it seems as though "even" is infinite in itself, and causes infinity in others.

Secondly, the same is shown by an example. To follow it one must know that in geometry a "gnomon" is the name for a square on the diameter with two supplements [i.e., three squares put together to form the shape of an "L"]. If a square is added to this gnomon, a square is constituted. From this likeness those

numbers may be called "gnomons" which are added to certain numbers.

Here one should notice that if one takes the odd numbers according to the order of natural progression, and to unity, which is a square as to power (since one times one is one), one adds the first odd number, namely, three, there will be constituted four, which is a squared number since twice two is four. If now to this second square there is added the second odd number, namely, five, one obtains nine, which is the square of three, since three times three is nine. Then if to this third square there is added the third odd number, namely, seven, one obtains sixteen, which is the square of four. And thus, following the ordered addition of odd numbers, there always arises the same form in those numbers, namely, a square.

By the addition of even numbers, however, there is always produced a different shape. For if the first even number, namely, two, be added to unity, there arises three, which has a triangular figure; if then to this there be added the second even number, namely, four, one has seven, which is in the shape of a heptagon. And thus, in this wise the figure of the resulting numbers constantly varies with the addition of even numbers.

And this appears to be a sign that uniformity belongs to odd number, while difformity and variation and the infinite belong to even number.

Hence he says, namely, that a sign of this, i.e., that infinity follows even number, is what occurs in numbers. For by the addition of gnomons, i.e., numbers, to one, i.e., to unity, and outside, i.e., to other numbers, sometimes there occurs another species, i.e., another natural form, namely, when one adds an even number; sometimes there occurs a single species, namely, when one adds an odd number. [rom this it is evident why Pythagoras attributed infinity to even number.

But Plato attributed it to two roots, namely, to the "large" and the "small." Tor these two, according to him, belong to matter, to which in turn the infinite belongs.

333. Then [229] he gives the opinions of the natural philosophers about the infinite. He says that all the natural philosophers, those, namely, who gave natural [i.e., sensible principles for things, taught that the infinite does not subsist by itself, as said above (no. 330), but is an accident of some nature. Hence those who posited just one material principle (some member of the list of things called elements, i.e., air or water or something intermediate) said it was infinite. But of those who posited a finite number of principles, none supposed them to be infinite in quantity: for the very distinction of the elements seemed to conflict with the notion that they could be infinite. But those who posited. an infinitude of principles said that from all those infinites was formed one infinite through contact.

334. Those who taught this were Anaxagoraa and Democritus, who differed in two respects.

They differed first as to the nature of the infinite principles: for Anaxagoras taught that the infinite principles were infinite similar parts of flesh and of bone and so on; but Democritus taught that-they were indivisible bodies differing in figure. He said these bodies were the seeds of all of nature.

Another difference was as in the relation of these principles one to the other. For Anaxagoras said that each of these parts was a mixture of all the others, so that in each part of flesh there was bone and vice versa and the same for the other parts. He came to this opinion because he saw that anything came from anything; and, hence, since he believed that whatever comes to be from something is in it, he concluded that everything is in everything. And from this he seems to assert that at some time all things were commingled and nothing was distinct from anything else. Just as this flesh and this bone are commingled (which is proved by the generation of one from the other) so is everything else commingled. Therefore at one time all things were together. For it is necessary to posit a principle of separation not only in one single thing but in all things simultaneously. He proved this thus: Whatever comes to be from something other was previously commingled with it and is produced by being separated from it; but all things are produced, though not all at the same time; therefore, there must be some one principle generating not only each thing but all things. This one principle he called "intellect," which alone has the capacity to separate and bring together because it is itself uncommingled.

Now whatever comes to be through intellect seems to have a principle; because intellect acts by starting from a definite principle. Therefore, if separation is brought about by intellect, separation must have a principle; hence, he concluded, at some time all things were together and the motion by which things were separated one from the other began in time, and did not previously exist. Thus Anaxagoras laid down one principle as producing another.

But Democritus said that one principle is not derived from another, but that the nature of body which is common to all indivisible bodies, though different in parts and figure, is the principle of all things according to magnitude, for he posited that all divisible magnitudes are composed of indivisibles.

And thus does Aristotle conclude that to consider the infinite pertains to the natural philosopher.

335. Then [230] he outlines four points of agreement among the early philosophers in regard to the infinite. The first of which is that all posited the infinite as a principle, and this "reasonably" i.e., for the following reason: If the infinite exists, it is impossible for It to be in vain, i.e., that it lack some definite standing among the beings of reality. But it can have no power other than that of

a principle. For all things in the world are either principles, or derived from principles. But it is not fitting for the infinite to have a principle, because what has a principle has an end. Hence it follows that the infinite is a principle. Note, however, that in ths reasoning, "principle" and "end" are both used equivocally; for that which is derived from a principle has a principle of origin whereas it is to have a principle and end of its quantity or size which is incompatible with infinite.

The second point of agreement is that they denied coming into existence and ceasing to exist to the infinite. This follows from the fact that it is a principle. For whatever is produced must have an ending just as it has a principle; and likewise any process of corruption has an end. But "end" and "infinite" are incompatible; hence the infinite can neither be generated nror corrupted. Hence it is clear that the infinite has no principle, but that the infinite is the principle of everything else.

This argument, too, uses "principle" and "end" equivocally, as above.

The third point of agreement is that they attributed to the infinite the prerogative of containing and governing all things, for this seems to belong to a first principle. And this was the opinion of those who did not grant in addition to matter, which they said was infinite, other causes, namely, agent causes, as Anaxagoras posited an intellect and Empedocles concord. For to contain and to govern pertain more to an active principle than to matter.

The fourth point of agreement was to attribute divinity to the infinite; for whatever is immortal or incorruptible they called divine. This was the doctrine of Anaximander and a number of the ancient natural philosophers.

LECTURE 7

Arguments for and against the infinite

336. Having listed the opinions of the earlier philosophers on the infinite, Aristotle now begins to inquire into the truth of the matter.

First he objects to both sides of the question;
Secondly, he solves the objections, in Lecture 10.

About the first he does two things:

First he gives reasons to show that the infinite exists;
Secondly, to show that it does not exist, at 342.

337. In regard to the first he gives five reasons to show that the infinite exists. The first of these is based on time, which according to the common opinion of the earlier philosophers was infinite [i.e., always was and always will be]. For Plato alone supposed that time was generated, as will be shown in Book VIII (l.2).

The first of these is taken from time, which, according to the common opinion of the ancients, was infinite. Indeed, Plato alone generated time, as will be said in Book VIII (l.2).

He says therefore first that tha infinite is shown to exist by five arguments. Abe first of these is taken from time, which is infinite according to those who held that time always was and always will be.

338. The second reason is taken from the infinite divisibility of magnitude. For even mathematicians use the infinite in their demonstrations. This, however, would not happen, if there were no infinite at all; hence the infinite exists.

339. The third reason is based on the perpetual processes of generation and. corruption according to the opinion of many; for if the infinite were denied, generation and corruption could not endure indefinitely; hence, it would have to te admitted that generation would sometime cease, which is against the opinion of many. Therefore, it is necessary to posit the infinite.

340. The fourth reason is based on the apparent nature of the infinite, to many seems to consist in this that it is something always included by something else, because we observe that every finite reaches into something else. Let a body be pointed out; if it be infinite, then the infinite exists; if it be finite, it must be terminated at something else, and this latter, if it in turn be finite, at something else. We must either proceed thus to infinity or come to a body that is infinite. In either case, the infinite exists. Hence there can be no end to bodies, if every finite body is always included by some other.

341. The fifth reason is taken from the apprehension of the intellect or of the imagination. Hence, he says that that which chiefly constitutes the common difficulty which induces men to posit the infinite is that the intellect never is exhausted but can always add something to any given finite amount. Now the earlier philosophers supposed that things corresponded to the intellect's or senses' apprehension of them; hence because they said that whatever appeared to be is true, as stated in *Metaphysics* IV (l.11), they believed that even in reality there exists an infinite. Hence number seems to be infinite, because the intellect can always create a new number, simply by adding unity to a given number. For the same reason mathematical magnitudes, which exist in the imagination, seem to be infinite, because, given any definite magnitude, we can imagine a greater. And for the same reason there seems to be an infinite space beyond the heavens, because we can imagine certain dimensions existing beyond the heavens to infinity.

Now if there be infinite space beyond the heavens, it seems that there is an infinite body and even infinite worlds. This for two reasons. The first is that if the totality of space be considered infinite, that totality will be uniform; hence, there is no reason why that space should be devoid of body in one part rather than in

another, Therefore, if there is found in one part of that space the bodily magnitude of this world, then there should be found in each part of that space some bodily magnitude comparable to that of this world. Thus body must be infinite in the same way as space or there must even exist infinite worlds, as Democritus supposed. Another reason proving the same point is that if there be infinite space, it is either empty or full. If it is full, we have our point that there is infinite body; but if it is empty, then since the empty is a place not filled with a body but capable of being so filled, it follows that if space is infinite, there is infinite place capable of being filled with body. Thus there must be infinite body, because in perpetual matters, there is no difference between what can be and what is. Hence, if infinite place can be filled with body, it must be admitted that it is fillee with infinite body. Therefore, it seems necessary to say that there is infinite body.

342. Then [232] he takes the opposite position. And in regard to this he does three things:

First, he shows that the matter is debatable, lest anyone suppose that the afore -mentioned reasons are unassailable;

Secondly, he gives the various meanings of the word "infinite," at 344;

Thirdly, he gives reasons showing that the infinite.,does not exist, at 345.

343. He says therefore [232] that there is a question about whether the infinite exists or not. For, on the one hand, many impossibilities follow upon holding that it does not; those, for example, listed in 337 ff. On the other hand, there are also difficulties attendant upon holding that the infinite does exist, as will be clear subsequently (no. 345 ff). There is doubt also as to its manner of existence. Does it exist as a substance does, or as an accident belonging essentially to some nature? Of if neither as a substance nor as an essential accident, but as an accident nevertheless, is there some infinite continuum and are there things infinite in number? Now it very much pertains to the philosopher of nature to discuss whether there exists such a thing as an infinite sensible magnitude, for a sensible magnitude is a natural magnitude.

344. Then [233] he shows in how many ways "infinite" is said, and lists two divisions of the infinite. The first division is con on to the infinite and to all things said privatively.

For "invisible" is said in three ways: either as denoting 1) what of its very nature 13 not apt to be seen, for example, a sound which is not in the genus of visible things; or 2) what is difficult to see, as what is seen in the dark or from a distance; 3) what is apt to be seen but is not, as something in total darkness. Correspondingly, what of its very nature is not apt to be passed over is called "infinite" (for the infinite is the same as that which cannot be passed over)—and this is because it belongs to the genus of intraversable things, as are indivisibles,

such as a point and a form; this is the way that a sound was called invisible. In a second way, infinity is ascribed to what could be passed over but its passage is impossible for us; thus, we say that the depth of the sea is infinite; or if it could be passed through, it would be with difficulty, as if we should say that a trip to India is infinite. Both of these belong to that which is "difficultly traversable." In a third way, infinity is ascribed to what is passable but there is no passage to its terminus; for example, a line without an end or any other such quantity without limits; this is the proper cense of the word "infinite."

He then gives the other division of infinite, [233 bis], saying that infinity is spoken either by addition, as in numbers, or according to division, ai in magnitudes, or both ways, as in time.

345. Then [234] he lays down the arguments leading to an exclusion of the infinite:

> First those excluding a separated infinite, such as laid down by the Platonists;
> Secondly, those excluding the infinite from sensible things, at no. 349.

With respect to the first he lays down three reasons. As to the first of these he says that it is impossible for the infinite to be separated from sensible things, in such a way that the infinite should be something existing of itself, as the Platonists laid down. For if the infinite is laid down as something separated, either it has a certain quantity (namely, continuous, which is size, or discrete, which is number), or not. If it is a substance without either the accident of size or that of number, then the infinite must be indivisible—since whatever is divisible is either number or size. But if something is indivisible, it will not be infinite except in the first way, namely, as something is called "infinite" which is not by nature susceptible to being passed through, in the same way that a sound is said to be "invisible" [as not being by nature susceptible to being seen], but this is not what is intended in the present inquiry concerning the infinite, nor by those who laid down the infinite. For they did not intend to lay down the infinite as something indivisible, but as something that could not be passed through, i.e., as being susceptible to such, but with the passage having no completion.

If, however, the infinite should not only be a substance, but also should have an accident which is size or number to which the infinite belongs, in such a way that the infinite would be inherent in the substance in the manner of that accident, then the principle of existing things will not be infinite as such the ancients laid down, just as we do not say that the principle of speech is invisible, although such a thing is an accident of sound, which is the principle of speech.

346. The second reason [235] is as follows. A passion is less separable and able to exist of itself than a subject. But the infinite is a passion of size and number—which cannot be separated and exist of themselves, as is proved in the *Metaphysics* [XI, l.10]. Therefore neither can this be

so of the infinite.

347. The third argument [236] is as follows. He [Aristotle] states that it is clear that the infinite cannot be laid down as being in act, and as being a certain substance, and as being the principle of things. For the infinite is either divisible, or indivisible.

If indeed it is divisible, every one of its parts will have to be infinite, on the supposition that the infinite is a substance. For if it is a substance, and is not predicated of any subject as an accident, then that which is infinite and the nature of the infinite, i.e., the essence and notion of the infinite, will have to be the same. For that which is white and the nature of white are not the same, but that which is man, and the nature of man, are. Whence it will be necessary that the infinite, if it be a substance, be either indivisible, or divided into parts which are infinite—which is impossible, since it is impossible to compose some same thing out of many infinities, as this would involve one infinite's being terminated by another infinite.

It likewise appears not only from argument but also from an analogy that if the infinite is a substance and is divided, it is necessary that each and every part of it be infinite.

For just as every part of air is air, so too every part of the infinite will be infinite, if the infinite is a substance and a principle. For if it is a principle, the infinite has to be a simple substance, not composed out of differing parts, as in the case of man whose every part is not man. Since, therefore, it is impossible for every part of some infinite to be infinite, the infinite must then be unable to be reduced to parts, and indivisible. But what is indivisible cannot be infinite in act—since whatever is infinite in act is quantitified, and everything quantified is divisible. It follows, therefore, that if there be any infinite in act, it is not after the manner of substance, but has the reason of the accident which is quantity. And if this be infinite, it will not be a principle, but that to which the infinite occurs, whether it be some sensible substance, such as air; or some intelligible substance, such as "even," as the Pythagoreans laid down.

Whence it is plain that the Pythagoreans did not speak sensibly, positing the infinite as a substance, and the same time holding it as divisible—since it follows that every part of it would be infinite, which is impossible, as said above.

348. Finally, he says that this question "whether there be an infinite in mathematical quantities and in intelligible things not having magnitude" is a more general one than the present question. For our question concerns sensible things about which natural science treats: "Whether among natural things there be a body infinite in size, such as the early philosophers posited.

LECTURE 8

No Sensible Infinite

349. After rejecting the opinion of the earlier philosophers who spoke non-naturally of the infinite, separating it from sensible things, the Philosopher now shows there is no infinite even in the sense in which the natural philosophers laid it down.

First he shows this by logical reasons;
Secondly by natural reasons in 353.

The first set of reasons are called "logical,"not because they proceed logically from logical terms, but because they proceed in a logical manner, i.e., from common and probable propositions, which is the characteristic of the dialectical syllogism.

350. He gives therefore [237] two logical reasons. In the first of theseit is shown that there is no infinite body. For the definition of body is that it is determined by a surface, just as the definition of a line is that its terms are points. But no body determined by a surface is infinite. Therefore, no body is infinite, whether it be sensible, i.e., a natural body, or intelligible, i.e., a mathematical body. (The word "rational" [or dialectical] should be here expounded as "logical" indeed, logic is called "rational philosophy.")

351. The second reason shows that there is no infinite multitude. For everything countable can be numbered and consequently passed through by counting. But every number and whatever has a number is countable. Therefore, every such thing can be passed over. If, therefore any number, whether separated or existing in sensible things, be infinite, it follows that the infinite can be passed through, which is impossible.

352. Notice that these reasons are probable and proceed from common premisses. For they do not conclude of necessity: in effect, whoever posits an infinite body would not concede that it would of its very nature be terminated by a surface, except perhaps potentially; although this is probable and well-known. Similarly, whoever would posit an infinite multitude would not admit it to be a number or that it has a number. For number adds to multitude the notion of measure, because a number is "multitude measured by unity," as is said in *Metaphysics* X. For this reason number is considered to be a species of discrete quantity, but multitude is not; it is, rather, a transcendental.

353. Then [238] he produces natural reasons to show that there is no infinite body in act.

In connection with these reasons ane must consider that since Aristotle had not

yet proved that the heavenly body was of another essence from that of the four elements, and the connon opinion of his time was that it was of the same nature as the four elements, he therefore proceeds in these reasonings as though there were no other sensible body outside of the four elements. This is in keeping with his custom, since he always, before proving that which is his own belief, proceeds from what is supposed by the common opinion of others. Hence, after he proved in *De Caelo* I (l.4) that the heavens are of another nature from the elements, he repeats, for the sake of the certitude of the truth, the consideration of the infinite, showing unqualifiedly that no sensible body is infinite.

Here, however, he first shows that there is no sensible infinite body on the supposition that the elements are finite in number; secondly he shows the same thing in a universal way, at no. 358.

He says therefore first that when one proceeds "naturally," i.e., according to the principles of natural science, one is better able, and with more certitude, to consider that there is no sensible infinite body from what will be said. For every sensible body is either simple or composite.

354. First therefore he shows that there is no composite sensible body that is infinite, supposing that the elements are finite according to multitude. For it cannot be that one of the elements is infinite and the others finite—because the composition of any compound body requires that there be a number of elements and that the contraries therein be somehow in equilibrium. If this were not so, the composition could not endure—for the strongest would destroy all the others, since the elements are contrary. But if one of the elements were infinite, no equilibrium would ensue as long as the other elements were finite, because there is no proportion between infinite and finite. Therefore it cannot be that only one of the elements in the composite be infinite.

But someone could claim that the infinite element might have such weak energy in acting, that it would not destroy the finite elements which are stronger; for example, if the infinite one were air and the finite one fire. And therefore, to remove this objection he says that no matter how much less the energy of that one infinite body is than that of the finite body (for example, if fire be infinite and air finite) nevertheless an infinite accumulation of air would be equal in energy to the fire. For if the energy of the fire is one hundred times greater than an equal quantity of air, then if the air be multiplied a hundredfold, it will equal the fire in energy; and yet air multiplied a hundred times is multiplied according to a finite number and is exceeded by the power of the whole infinite amount of air. Hence, it is clear that even the energy of the fire will be overcome by the energy of infinite air: thus the infinite will excel and corrupt the finite, no matter how powerful its nature.

355. Similarly, it cannot be that any of the elements out of which a compound

body is composed be infinite; because it is a property of a body that it have dimensions in every direction, and not in length only, as in a line, or in length and width only, as on a surface. But the nature of the infinite is to have infinite "distances" or dimensions. Therefore, the infinite body should have infinite dimensions in every direction. Thus, it cannot be that one body result from a number of infinite bodies, because each occupies the whole world, unless you posit that two bodies interpenetrate, which is impossible.

356. Therefore, having shown that a composite body cannot be infinite, he now proves that neither can a simple body, nor one of the elements, nor any medium among the elements(taking vapor as a medium between air and water) be infinite. For some posited this last as a principle stating other things to be generated from it. And they said that this was something infinite, but not air or water or any of the other elements; because the other elements would be corrupted by whichever one was supposed as infinite. For the elements have contrariety one to the other since air is humid, water cold, fire hot and earth dry. Hence if one of them were infinite, it would destroy the others, since one contrary is disposed to be corrupted by another. And that is why they said that something other than the elements was infinite, from which, as from a principle, the elements arose.

Now he states this position to be impossible not only as to its maintaining such a mediate body to be infinite, since there will be applied a same common argument [in no. 35] to fire and air and water and likewise to the mediate body, but also as to its laying down some elemental principle in addition to the elements.

For there is found no sensible body outside of those things called the "elements," namely, air, water, and the like. But this would have to be the case if anything besides the elements should enter into the composition of such bodies. If, therefore, anything else should enter into the composition of those bodies in addition to the four elements, it would follow that we should find here some simple body besides the elements, by the resolution of the above bodies into their elements. It follows therefore that the aforesaid position is false as to its positing of some simple body besides the known elements.

357. He further shows by a general argument that none of the elements can be infinite. For if any of the elements were infinite, it would be impossible for the whole universe to be anything but that element. It would likewise be necessary that all the other elements be changed into it, or to have already been changed into it, due to the excess of power of the infinite over other things, as Heraclitus says that at some future time all things will be converted into fire because of the excelling power of fire. And the same reason holds good for one of the elements and for come other body that some natural philosophers create besides the elements. For it is necessary that this other body have contrariety toward the elements, since other things are laid down as being generated from it, and

change does not take place except from ;)ne contrary to another, as in the case of going from hot to cold, as shown above (I, l.10). This middle body would therefore in this way destroy, by reason of its contrariety, the other elements.

LECTURE 9

No infinite body shown absolutely

358. After showing that there is no infinite sensible body on the assumption that the elements are finite, the Philosopher here shows the same absolutely, without assumptions of any kind.

First he declares his intention;
Secondly he carries out his proposal, at 359.

He says therefore first [239] that in what follows it is necessary to consider every body universally, without any suppositions, and ask whether any natural body can be infinite. And from the follwwing reasons it will be clear that none can. Then, he proves his proposition with four reasons, beginning at 359. The second reason begins at 367; the third at 368; the fourth at 369.

In regard to the first reason he does three things:

First he lays down certain facts presupposed to his reasoning;
Secondly he gives the reasoning itself, at 360.
Thirdly, he excludes a false opinion, at 364.

359. Therefore [240] he lays down three presuppositions. The first of these is that every sensible body has a natural aptitude to be in some definite place. Secondly, that every natural body has, among available places, some place that befits it. Thirdly, that the natural place of the whole and of the part is the same, i. e., of all earth and each clod, of all fire and each spark. A sign of this is that in whatever part of the place of the whole there is placed a part of some body, it is at rest there.

360. Then [24171 he gives the [first] reason, which is this. If an infinite body be supposed, it must have parts either of the same species, as water or air, of parts of varying species, as a man or a plant has.

If all its parts are of the same species, it follows according to our pre-suppositions (no. 359) that it is either entirely immobile and is never moved, or is always being moved. But both of these are impossible: for in the second case, rest is excluded; and in the other, motion is excluded from natural things. Thus, in both cases there is denied the notion of nature, for nature is a principle of motion and of rest.

He proves that this body would be either entirely mobile or entirely at rest by the

fact that no reason can be given for its being moved either up or down or in any direction whatsoever. He manifesto this by an example: for let us suppose that the entire infinite body which is similar throughout is earth. Then it will be impossible to say where any clod of earth should move or be at rest, because each part of infinite place would be occupied by some body related to it, i.e., of the same species. Can it be said that one clod of earth would be moved so as to occupy successively all the infinite places, as the sun is moved so as to be in each part of the zodiacal circle? And how could one clod of earth pass through all the parts of infinite place? Now nothing is moved toward the impossible: if therefore it is impossible for a clod of earth to be moved so as to occupy all the infinite places, in which place will it rest and in which will it be in motion? it will either always be at rest and thus never in motion or it will always be in motion and thus never at rest.

361. If we suppose the other possibility, namely, that the infinite body has parts that are unlike in species, it will then follow that there would be unlike places for the unlike parts, for the natural place of water is one thing and that of earth is another, But on this supposition it follows at once that the body of this infinite whole would not be one body simply but one through contact; and thus there will not be one infinite body as our supposition granted.

362. Because someone might not consider this impossible [i.e., an infinite body of dissimilar parts], he adds another reason against this, saying that if the infinite whole is composed of unlike parts, these parts will be either of a finite number of species or of an infinite number. It will not be the first, because it then follows that if the whole is infinite, then some of the parts will be finite and some infinite; otherwise we would be able to get an infinite composed all of finites. On this assumption it follows that those which are infinite will corrupt the others, on account of contrariety, as was said in previous reasoning (nos. 354, 356). For this reason, no one of the early philosophers who posited one infinite principle, posited it to be fire or earth, which are extremes; rather they posited water or air or some medium between them, because the places of the former were evident, i. e., above and below, but it is not the same with the others, for earth is below in respect of them and fire above.

363. But if someone admits the other alternative, namely, that the parts of the body are infinite in species, it follows that their places also are infinite in species, and that the elements are infinite. But if it is impossible that the elements be infinite, as was already proved in Book I (I.11), and that places be infinite, since it is not possible to find infinite species of place, it is necessary to admit that the whole body is finite.

And because he had concluded to an infinity of places from the infinite of bodies, he adds that it is impossible not to equate body with place; for no place is greater than the body it contains, nor can a body be infinite if its place is not infinite, nor

can in any way a body be greater than its place. This is so because if the place is greater than the body, there will be some empty place; if the body is greater than its place, then some part of the body is in no place.

364. Then [242] he excludes an error. First, he cites the error and says that Anaxagoras claimed that the infinite is at rest but gave an invalid reason for its rest. For he said that the infinite bears up, i.e., sustains itself since it exists in itself and not in something else, for nothing contains it. And thus it could not be moved outside itself.

365. Secondly [24R] he disproves this statement with two reasons. The first of which is that Anaxagoras so assigned his reason for the rest of the infinite as to suppose that wherever a thing is, that is its natural place, for the only reason he gave for saying that the infinite is at rest, is that it exists in itself. But it is not true that where a thing is, there it is always naturally disposed to be, because some things are somewhere by force and not by nature.

Now although it is true that an infinite whole is not moved, because it is sustained and remains in itself and for that reason is immobile, yet a reason should be given why it is not naturally disposed to be moved. one cannot evade this simply by saying that the infinite is not moved, since by the same reasoning there is nothing to prevent any other body from not being moved while it might be naturally disposed to be moved. Because oven if earth were infinite, just as now it will not be carried further when it is in the center, so even then no part in the center would move further: but this would not be because it had no other natural place except the center where it could be sustained but because it does not have a natural aptitude to be moved from the center. If, therefore, this is the case with earth, that the reason why it rests at the center is not that it is infinite but that it has gravity which accounts for its remaining in the center; similarly, in the case of any other infinite, the reason why it rests should be given, and this is not simply because it is infinite or that it supports itself.

366. He lays down another argument [244]. Thus he states that if the whole infinite is in repose because it remains within itself, it follows that any part thereof necessarily is necessarily at rest since it remains within itself. For the place of the whole and the part is the same, as was said (no. 359), e.g., that of fire and a spark upwards, that of earth and a clod of earth downward. If, therefore, the place of the whole infinite is itself, it follows that any part of the infinite will remain at rest within itself as in its proper place.

367. He gives a second reason against Anaxagoras [245] saying that it is clearly impossible to say that there is an actually infinite body and that there is some place for each body, if every sensible body is either heavy or light, as the ancients said who posited the infinite. Because if the body is heavy, it will be naturally carried to the center; if it is light, it will be carried upward. If, therefore,

there be an infinite sensible body, there must be in it an "up" and a center. But it is impossible that the infinite body should sustain in itself either of these, i.e., either an "up" or a center, or even that it sustain both according to different centers. For how could the infinite be divided so that one part would be "up" and another "down" or how can there be in the infinite a boundary or a center? Therefore there is no infinite sensible body.

368. He gives the third reason [246] saying that every sensible body is in place. But the differences of place are six: above, and below, before and behind, to the right and to the left—and these are determined not only in relation to us but even in the whole universe itself.

For such positions are determined in themselves in those things in which there are determinate principles and terms of motion. Whence in living things "up" and "down" are determined according to the movement of food; "front" and "rear" according to the movement of sense; "right" and "left" according to forward motion, which begins from the right. But in inanimate things, in which there are no determinate principles of such motions, "right" and "left" are said with respect to us—for a column is said to be "at the right" which is to the right of a man, and "at the left" which is at his left.

But in the whole universe "up" and "down" are determined according to the movement of heavy and light things; while according to the motion of the heavens the rising sun determines "right," the setting sun, "left"; "front" is determined by the upper hemisphere, "rear" by the lower hemisphere; "above" by the south, "below" by the north. Now such things cannot be determined in an infinite body. It is therefore impossible for the whole universe to be infinite.

369. Then [247] he gives the fourth reason, saying that if it is impossible that there be an infinite place because every body is in a place, it follows that there can be no infinite body. That an infinite place is impossible be proves thus: To be in place and to be in some place are convertible, just as to be man and to be some man or to be quantity and to be some quantity. Therefore, just as it is impossible that there be infinite quantity, because then it would follow that some quantity is infinite, e.g., two cubits or three cubits, which is impossible, so infinite place is impossible , because it would follow that some place is infinite (either up or down or some other place), which is impossible—since each of these implies a definite term as was said (in 368). Therefore no sensible body is infinite.

LECTURE 10

The infinite as existing in potency

370. After discussing the infinite dialectically, the Philosopher now begins to determine the truth.

First he determines whether there is an infinite;
Secondly, what it is, at 382.

The first is divided into two parts:

In the first, he shows how the infinite exists;
In the second, he compares various infinites one to the other, at 374.

About the first he does three things:

First, he shows that the infinite in a way exists and in a way it does not;
Secondly, he shows that it is in potence and is not as a being in act, at 372;
Thirdly, he manifests how it is in potency, at 373.

371. Accordingly, he says first [246] that from the foregoing (ll.8.9) it is manifest that there is no infinite body in act. It is also clear from what has been said (l.7) that if the infinite absolutely does not exist, many impossibilities arise. One is that time will have a beginning and an end, considered impossible by those holding for the eternity of the world. Another is that it would follow that a magnitude would not be always divisible into further magnitudes, but eventually one would arrive through division of magnitudes at certain things which are not magnitudes. But every magnitude is divisible. Likewise, it would follow that number could not increase to infinity. Since therefore, according to what has been said (ll.7-9) neither seems to occur, i.e.,) either an infinite in act or no infinite at all, it must be said that the infinite somehow is and somehow is not.

372. Then [244] he shows that the infinite is as a being in potency. And he says that something is said to be in act and something is said to be in potency. Now the infinite is said to come about either by addition, as in numbers, or by subtraction, as in magnitudes. Now it has been shown that magnitude is not infinite in act; hence in magnitudes an infinite through addition is not found, but there is found in them an infinite through division. For it is easy to destroy the opinion that posits lines as indivisibles, or according to another letter, it is easy "to divide indivisible lines," i.e, to show that lines held indivisible by some, are divisible. Now the infinite, whether in addition or division, is spoken of to the extent of the ability [or potency] to add or divide. It therefore follows that the infinite is as a being in potency.

373. Then [256] he shows how the infinite exists in potency. For something is found to be in potency in two ways. In one way, in the sense that the whole can be reduced to act, as it is possible for this bronze to be a statue, because at some time it will be a statue. But the infinite in potency is not so meant as that which later will be entirely in act. In another way, something is said to be in potency in such a way that later it will be in act, not, indeed, all at once, but part after part. For there are many ways in which a thing is said to be: 1) because the whole exists at the same time, as in the case of a man or a house; or 2) because

one part of it always comes to be after another part, in the way that a day is said to exist and a competition exists.

It is in this latter way that the infinite is said to be at once in potency and in act. For all successive things are at once in potency as to one part and in act as to another part. For the Olympic games, i.e., the festive contests held on Mt. Olympus, are said to be and to continue as long as the contests are scheduled and as long as the schedule is being carried out. For as long as those games lasted, one part of the schedule was taking place at the time and another was to take place later.

374. Then [251] he compares various infinites one to another:

First he compares the infinite of time and of generation to the infinite which is in magnitudes;

Secondly, he compares the infinite according to addition to the infinite according to division in the case of magnitudes, at 377.

In regard to the first he does three things:

First, he proposes his intention and says that the infinite in the generation of man, and in time, must be explained in a manner different from that of the infinite in the division of magnitudes.

375. Secondly [252] he shows what is common to all infinites, saying in all of them it is universally found that the infinite consists in always taking one thing followed by another according to some certain succession, in such away that the whole of whatever is taken, be finite. Hence one must not suppose the infinite to be some whole existing all at once, as a substance that can be pointed out, e.g.,a man or a house. Rather the infinite must be taken as in the case of successive things, such as a day or a tournament, whose existence is not that of a perfect substance actually existing as a complete whole all at once. Now, in generation and corruption, even though the process continue to infinity, whatever is taken in act is finite. For in the whole course of generation, even should it proceed to infinity, both all the men existing at a given time are finite in number, and this finite amount must be taken as other and other, accordingly as men succeed one another in time.

376. Thirdly, [253] he shows how they differ, saying that the finite actually present in magnitudes as a result of adding or of dividing is permanent and is not corrupted, but the finites considered in the infinite course of time and of human generation are corrupted, although in such a way that time and generation themselves do not fail.

377. Then [254] he compares the two types of infinite which are found in magnitudes; namely, the infinite according to addition and the infinite according to division. About this he does three things:

First he shows their points of agreement;
Secondly, he shows wherein they differ, at 379;
Thirdly, he draws a conclusion from what has been said, at 380.

In regard to the first, [254] he says that in some sense the infinite resulting from addition is the same as the one resulting from division, because the former comes to be as a converse of the latter. For it is accordingly as something is divided to infinity, that additions to infinity seem to be able to be made to some determinate quantity.

378. He demonstrates, therefore, how the infinite in division exists in magnitude.

Thus he states that if someone, in some infinite magnitude, having taken some determinate part by division, should then continue to take other parts by division, always maintaining the same ratio, I.e., proportion, he will not go through that finite magnitude by means of division.

For example, from a line of one cubit we may take one half, and from the remainder one-half again. We can proceed in this process to infinity. For the same proportion will be maintained in subtracting, but not the same amount of what is subtracted. The half of the half is less, according to quantity, than the half of the whole. But if we were to take away always the same amount, the proportion taken away would be continually growing. For example, if from a quantity of ten cubits, we take away one cubit, the ratio of the part removed to the original is one-tenth. If we take from the remainder another inch, the ratio between the part removed and that which remains will be in a greater proportion [i.e., one-ninth]. For one cubit is less exceeded by 9 than by 10. Just as, by preserving the same proportion throughout, the quantity subtracted is continually smaller, so, by taking away the same amount each time, the proportion gets continually larger. If, therefore, by so subtracting from some finite magnitude, we continually increase the proportion by taking away the sawe amount, the original magnitude will be exhausted. For example, if from a line of 10 cubits we always subtract one cubit. This will happen because every finite thing will be exhausted by continually removing the same finite amount.

The infinite that depends on division does not exist, therefore, except in potency, but with this potency there exists always something in act, as was said of a day or of a tournament. And since the infinite is always in potency, it is assimilated to matter, which likewise is always in potency; and it never exists in act in its entirety, the way that the finite is in act. And just as the infinite according to division is at once in potency and act, so too is the infinite according to addition, which has been shown to be in some sense the same as the infinite according to division, as was said (no. 377). And the reason why the infinite according to addition is in potency is that it can always grow through addition.

379. Then [2557he shows the difference between the infinite according to addition and the infinite according to division. And he says that the former does not exceed any given finite magnitude, whereas the latter diminishes beyond any pre-determined smallness. For If we take any predetermined smallness, for example, the width of a finger, we can, by repeated halving of a line of 10 cubits, arrive at a remainder which is less than the width of a finger. But in adding to infinity, in distinction to division, there will exist some given finite quantity which will never be gone through. Take two magnitudes each of 10 cubits, and a third one of 20 cubits. If what I subtract to infinity from one magnitude of 10 cubits, always taking a half, is added to the other, which is also of 10 cubits, I shall never reach, by adding to infinity, the measure of the quantity of 20 cubits, since as much as remains in the quantity being divided will be lacking from the given measure in the quantity being added to.

380. Then [256] he draws a conclusion from the foregoing. First he draws it; secondly he explains it by a saying of Plato, at 381.

He says therefore first [256] that since addition to infinity never actually transcends every determined quantity, it is not possible, even in potency, to transcend every determined quantity by addition. For if there were in nature potency for addition transcending every quantity, it would follow that something actually infinite exists; such an infinite would be an accident of some nature, in the same way that the natural philosophers posit, outside the world we see, some sort of infinite, whose substance is air or something similar. But if, as was shown (ll.8,9), no infinite sensible body exists in act, it follows that there is in nature no potency to transcend every magnitude by addition, but only a potency to the infinite addition which is in contrast to [and derived from] division, as was said above (no. 379).

Why the existence of a potency to infinite addition transcending every magnitude would imply a body infinite in act, whereas in numbers infinite addition transcending every number does not imply an actually infinite umber will be explained below(in Lecture 12).

381. Then [257] he confirms what he has said by a dictum of Plato, saying that because the infinite resulting from the addition of magnitudes is the reverse of division, Plato therefore posited two infinites: "the large," which pertains to addition, and "the small," which pertains to division—for the finite seems to excel both by addition unto increase, and by division unto decrease or towards nothing. Yet although Plato makes two infinites, he does not use them. For in number, which he posited to be the substance of all things, there is no infinite by division since there is among them something smallest, which is unity; nor is there according to him an infinite according by addition, since he said that the species of number vary only up to ten and then a return is made to unity when we count eleven, twelve, and so on.

LECTURE 11

Definition of the infinite

382. After showing how the infinite exists, the Philosopher now explains what it is. About this he does three things:

First he shows what the infinite is;
Secondly, from this he assigns the reason for the things said of the infinite, at 390 (l.12).
Thirdly, he solves the difficulties mentioned earlier, at 400 (l.13).

In regard to the first he does two things:

First he shows what the infinite is and rejects the false definition of some;
Secondly, he rejects a certain false opinion that follows from the above false definition, at 387.

About the first he does three things:

First, he proposes what he intends;
Secondly, he explains the proposition, at 384;
Thirdly, he draws a conclusion, at 386.

383. He says therefore [258] that the infinite must be defined in a manner contrary to the way some have defined it. For some have said that infinite is 'that outside of which there is nothing," whereas, to the contrary, it should be defined as "that beyond which there is always something."

384. Then [259] he explains his proposition.

First he shows that his description is good;
Secondly, that the description of the earlier philosophers is incompetent, at 385.

He shows therefore first by an example that the infinite is "that beyond which there is always something." For some people say that a ring is infinite since, because it has a circular direction, one can always take part after part. But this is to speak analogously and not properly, because to be infinite requires this, namely, that beyond whatever part is taken there be some other part, in such a way, nevertheless, that one never take again a part taken previously. But in a circle this does not happen, because the part which is counted after another happens to be different from that immediately before it, but not from all the parts previously counted, because one part can be counted any number of times, as is evident in a circular motion. Therefore, if rings are called infinite according to this analogy, it follows that that which is truly infinite is something which always has

something beyond, if one were to measure its quantity. For it is impossible to measure the quantity of the infinite; but if someone should desire to reckon it, he would take part after part to infinity, as said above.

385. Then [260] he proves that the definition of the earlier philosophers is since "that outside of which there is nothing" is a definition of the perfect and a whole thing. Here is his proof. Every whole is defined as "that to which nothing to lacking"—as we speak of a whole man, or of a whole box, if they lack nothing which they ought to have. And just as we speak thus in regard to some individual whole, as in the case of this or that particular, so too this notion holds in regard to what is truly and perfectly whole, namely, that outside of which there is absolutely nothing. But when something is lacking through the absence of something intrinsic, then such a thing is not a whole.

So it is evident that this is the definition of a whole: "a whole is that nothing of which is outside of it." But a whole thing and a perfect thing are either entirely the same or of a proximate nature. He says this, because "whole" is not found in simple things which have no parts; in which things, nevertheless, we use the word "perfect." This shows that the perfect is "that which has nothing of itself outside of it." But nothing that lacks an end is perfect, because the end is the perfection of each thing. For the end is the term of that of which it is the end. Nothing infinite, therefore, and unterminated, is perfect. Hence the definition of the perfect as that, namely, which has nothing of itself outside itself, does not apply to the infinite.

386. Then [261] he draws a conclusion from the foregoing. Since the definition of a "whole" does not apply to the infinite, it is clear that the position of Parmenides is better than that of Melissus. For Melissus said that the whole universe was infinite. Parmenides said the whole is terminated by what is "striving equally from the middle,"by which he designated the body of the universe as spherical. For in a spherical figure, lines from the center to the term, i.e., the circumference, are drawn according to equality, as though "striving equally" with each other. And it is rightly stated that the whole universe is finite, for to be a whole and to be infinite are not reciprocally connected, i.e., not continuous as thread follows thread in spinning. For there was a proverb that things which follow one upon the other should be said to be continuous as thread following thread.

387. Then [262] he rejects a false opinion that arose from the aforesaid definition, and first in a general way, covering all variations; secondly the opinion of Plato, at 389.

He says therefore first that because some thought that whole and infinite were mutually connected, they consequently took it as a "dignity" [axium], i.e., something self-evident, that the infinite contains all things and that it has all things in itself. This was due to the fact that the infinite has a likeness to a whole,

as what is in potency has a likeness to act. For the infinite, inasmuch as it is in potency, is as matter in respect to the perfection of magnitude, and it is as a whole in potency, not as a whole in act. This is proved by the fact that the infinite is based on the possibility of dividing things into what is smaller and of making, by a contrasting division, continual additions, as was said above (I.10). Consequently, the infinite in itself, according to its proper nature, is a whole in potency only; and it is something imperfect, comparable to matter not having perfection.

For it is not whole and infinite [or finished] according to itself, i.e., according to proper notion by which it is infinite, but according to something other, i.e., according to end and whole, to which it is in potency. For division, which is possible *ad infinitum* , is called "perfect" insofar as it is, whereas the division that goes on *ad infinitum* is imperfect. And it is clear, since it is the whole that contains but matter that is contained, that the infinite an such does not contain but is contained. This is true, insofar, namely, as whatever is in act of the infinite is always contained by something greater, accordingly as it is possible to take something beyond.

388. Now from the fact that the infinite is as a being in potency, not only does it follow that the infinite is contained and does not contain, but two other conclusions also follow. One is that the infinite, as such, is unknown, because it is as matter without species, i.e., form, and matter is not known except through form. The other conclusion, which has the same source, is that the infinite has more the notion of a part than that of a whole, since matter is compared to the whole as a part. And it is not a surprise that the infinite conducts itself as a part, inasmuch as only a part of it is ever actual.

389. Then [263] he rejects an opinion of Plato who posited an infinite both in sensible and in intelligible things. And he states that from this it is plain also that if "the large" and "the small." to which Plato attributed infinity, are in sensible and intelligible things as containing (by virtue of containment being attributed to the infinite), it follows that the infinite contains the intelligible things. But this seems unfitting and impossible, namely, that the infinite, since it is unknown and undetermined, should contain and determine intelligible things. For the known is not determined by the unknown, but rather the converse is true.

LECTURE 12

Explanations in the light of the definition of the infinite

390. After giving a definition of the infinite, the Philosopher now assigns reasons for the things that are said about the infinite.

First, the reason for what is said about addition and division of the infinite;

Secondly, the reason for saying that the infinite is found in different things according to a certain order, at 397;

Thirdly, the reason for saying that mathematicians use the infinite, at 398;

Fourthly, the reason why the infinite is called a principle, at 399.

About the first he does two things:

First he presents the reason for what is said about the infinite in relation to division and addition in magnitudes;

Secondly, the reason for what is said of it in numbers by comparison to magnitudes, at 392.

391. It was said above (no. 379) that addition to infinity in magnitudes takes place in such a way that the resulting magnitude does not become greater than any given magnitude. But division to infinity in magnitudes results in reaching a quantity that is smaller than any pre-assigned quantity, as was expounded above (no. 379). However, he states [264] that this occurs reasonably, for since the infinite is like matter it is contained within just as matter is, while that which contains is the species and form. Now it is clear from what was said in Book II (l.5) that the whole is like form and the parts are like matter. Since, therefore, the division of a magnitude proceeds from the whole to the parts, it is reasonable that no limit be found there which is not transcended through infinite division. But the process of addition goes from the parts to the whole, which is like a form that contains and terminates; hence it is reasonable that there be some definite quantity which infinite addition does not exceed.

392. Then [267] he explains infinity in numbers by comparison to magnitudes. For it was said that in number there is a smallest terminus below which division does not go; but there is no maximum limit which it cannot exceed, because it is possible through addition to exceed any given number. The opposite hcwever takes place in magnitudes, as was said (no. 391). The reason why is because every unity, inasmuch as it is a unity, is indivisible, as indivisible man is one man and not many men. Now every number can be resolved into unity, as is evident from the nature of number. For number signifies that there are more things than one, and any plurality exceeding one to a greater or lesser degree constitutes a definite species of number. Hence, since unity pertains to the notion of number and indivisibility pertains to the notion of unity, It follows that the division of number should halt at an indivisible terminus.

This statement that it is of the nature of number to be more than unity he explains by appealing to the species of number, because 2 and 3 and every other number is denominated by unity. Wherefore it is said in *Metaphysics* that the substance of 6 consists in its being six times one and not two times three, or three times two. Otherwise, it would follow that of the same thing there would be more than one definition and

more than one nature, since, starting from different parts, a same number would come about in different ways.

393. Then [266] he gives the reason why in numbers addition exceeds any predetermined multitude. And he says that we can always think of a number greater than any given number, for the reason that magnitude is divided to infinity. For it is plain that division causes multidude; hence the more magnitude is divided the greater is the multitude that results, and upon the infinite division of magnitudes there follows the infinite addition of numbers. Therefore just as infinite division of magnitude is not in act but in potency, and exceeds every determinate quantity in smallness, as was said (nos.391,392), so the infinite addition of numbers is not in act but in potency, and exceeds every determinate multitude. But this number which is thus multiplied to infinity is not a number independent of the division of magnitudes.

394. On this point it must be remembered that division, as was stated (no.393), causes multitude. But division is of two kinds: one is formal, which is through opposites; the other is according to quantity. Now the first division causes that multitude which is a transcendental, accordingly as being is divided into "one" and "many"; but the division of continuous quantity causes number, which is a species of quantity, insofar as it has the notion of measure. And this number can grow to infinity, just as magnitude is divisible to infinity. But the multitude which arises from formal division cannot grow to infinity. For the species of things are determined, just as there is a determined quantity of the universe. That is why he says that the number which grows to infinity is not separated from the division of the continuum. Nor is this number infinite in the sense of something permanent. Rather it is as something always in a state of becoming, inasmuch as, to any given number, additions may be successively made, as is evident in the case of time and the number of time. For the number of time increases successively by the addition of day to day but not all days existed at once.

395. Then [267] he shows that the opposite occurs in magnitudes. For although a continuum be divided to infinity, as was said (nos. 393,394), the size cannot grow indefinitely even potentially. For as great as a thing is in potency, so great can it be in act. If, therefore, it were in the potency of nature that a magnitude grow to infinity, it would follow that there would actually be some infinite sensible magnitude—which is false, as stated (ll.8.9). The consequence is, therefore, that addition of magnitudes cannot go on to infinity so as to exceed every pre-determined quantity; for otherwise there would be something greater than the heavens.

396. [rom the foregoing it is plain that the claim of some that in primi matter there is a potency to every quantity is false; for in prime matter there is a potency only to determined quantity. It Is plain also from the foregoing why number does not have to be as great in act as it is potentially, as is said here of

magnitude: for addition occurs in number as a consequence of the division of the continuum, by which one passes from a whole to what is in potency to number. Hence one need not arrive at some act terminating the potency. But the addition of magnitudes arrives at act, as was said (no. 391).

The Commentator [Averroes], however, assigns another reason: namely, that potency to addition in magnitude is in one and the same magnitude but the potency to addition in numbers is in various numbers inasmuch as to any number something can be added. But this reason has little value because just as addition produces varying species of number, so also varying species of measure, as, for example, "two cubits long" and "three cubits long" are called species of quantity. Moreover, whatever is added to a higher number is added to the lower. Accordingly, there is in one and the same number, e.g., two or three, a potency to infinite addition.

397. Then [260] he shows how the infinite is found in diverse ways in diverse things. And he says that the infinite is not found according to the same aspect in motion and magnitude and time, as if it were one nature being predicated univocally in all three cases. Rather it is said of the subsequent member in terms of its antecedent, for example, of motion by reference to the magnitude in which notion takes place (whether it be local motion, alteration or augmentation;) and of time by reference to notion. This happens because the infinite pertains to quantity, and notion is quantified by reference to magnitude, while time is quantified by reference to motion, as will be evident below (Bk. IV, l.17). And therefore he says that we are now mentioning these, but later what each of them is will be explained, as well as that every magnitude is divisible into magnitudes (Bk. VI, l.1).

398. Then [269] he explains how mathematicians make use of the infinite, and says that the argument that there is no actually infinite magnitude,(ll.8,9) does not destroy the consideration of the mathematicians, who use the infinite, as, for examplao when the geometer says, "Let this line be infinite." For they do not need for their demonstrations the infinite in act,nor do they use it, but they need only some finite line of sufficient quantity for their needs, so as to be able to subtract from it so much as they wish. For their purpose it is enough that there exist some maximum magnitude which can be divided according to any proportion in respect to another given magnitude. Hence, for purposes of demonstration, it makes no difference whether this maximum magnitude be one way or the other, i.e., finite or infinite;but as to the being of things, it makes a great difference whether it is one or the other.

399. Then [270] he shows how the infinite is a principle. And he says that since there are four genera of causes, as was said above (Bk. II), the infinite is a cause in the manner of matter. For the infinite has being in potency, which is proper to matter. Now matter is sometimes under a form and sometimes under privation.

The infinite, however, has the notion of matter, not insofar as matter lies under a form but inasmuch as matter has privation—for the infinite implies the lack of perfection and term. That is why the Philosopher adds that the being of the infinite is privation, i.e., the notion of the infinite consists in privation.

And lest anyone suppose that the infinite is matter like prime matter, he adds that the *per se* subject of the privation which constitutes the nature of the infinite is the sensible continuum. That this is so is clear from the fact that the infinite found in numbers is caused from the infinite division of magnitude; and similarly, the infinite in time and notion are caused by magnitude. Hence, the first subject of the infinite in the continuum. And since really existing magnitude is not separated from sensible things, it follows that the subject of the infinite is sensible.

And on this point all the earlier philosophers agree who use the infinite as a material principle. Wherefore they improperly attributed to the infinite the capacity to contain, for matter does not contain but rather is contained.

LECTURE 13

Solution of arguments in favor of existence of the infinite

400. After the Philosopher has used the definition of the infinite to explain the things attributed to it he now solves the argument presented above (l.7) to show the infinite existed.

First, he proposes his intention;
Then he follows it out, at 401.

He says therefore first [271] that after speaking of the nature of the it remains to settle the arguments which appeared to show that the infinite is not only something in potency, as we determined above (l. 10), but that was in act, as things are that are finite and determined. For some of the arguments do not conclude necessarily but are entirely false, while others are partially true.

401. Then [272] he solves the five reasons cited above (l.7) as proving that the infinite exists. And first he solves the one based on the fact of generation. For it concluded that if generation does not cease, then the infinite must be. Now this argument concludes truly insofar as the infinite is in a potency that is successively reduced to act. But it is not necessary that there be some sensible body which is infinite in act, in order to account for generation not ceasing, as the earlier philosophers supposed when they said that generation continues to infinity, supposing it to take place by extracting from some body, with the consequence that the process could not be infinite unless that body were infinite. But this is not necessary: for even supposing the whole of sensible body as finite,

generation can endure ad infinitum by the fact that the corruption of one thing is the generation of another.

402. Then [273] he solves the argument based on the principle of contact, as though it were necessary for every finite body to touch some other body and so on to infinity. But he solves this by saying that it is one thing to be "touched" and another to be "terminated", because to be "touched" and "enclosed" are said in respect to something else, for whatever touches, touches something else. To be "terminated," however, is said absolutely and does not imply a relationship to something else, because a thing is made finite in itself by its own terminations. For it is incidental to the finite that it be touching something. Nevertheless, neither is it necessary that everything touched by something should touch something else and that this go on to infinity. Hence it is evident that this argument does not conclude anything of necessity.

403. Then [274] he solves the argument based on the intellect and the imagination, which latter the ancients did not distinguish from the intellect. This argument above (I.7) concluded that there was outside the universe an infinite space, and consequently a place and a body. But it is incorrect to "trust to thought," i.e., believe that whatever is apprehended by the imagination or intellect is true, as some of the ancients thought, whose opinion is refuted in *Metaphysics* IV. For if I apprehend a thing as smaller or larger than it is, it does not thereby follow that there is such an abundance or defect in the object itself but only in the apprehension of the intellect or imagination. For one might understand some man to be a multiple of himself, i. e., two or three times larger than he really if, or any other amount to infinity, yet there will not be because of this a corresponding multiplication of him outside the intellect or outside a definite quantity or magnitude.

404. But while a thing remains what it is, one can conceive of it in such a manner. Then [275] he solves the difficulty based on time and motion. And he says that time and motion are not infinite in act, because nothing of time is actual but the "now," and nothing of motion is actual except a kind of indivisible. But the intellect apprehends a continuity in time and in motion by apprehending an order of "prior" and "posterior," in such a way, however, that what was first taken in time or in motion does not remain in the same state. Hence it is not necessary to say that the whole of motion is infinite, or that the whole of time is infinite.

405. Then [276] he solves the argument based on magnitude, and he says that magnitude is not infinite in act either as a result of division or of an intelligible increase, as is evident from what was said above (II.8-10).

Finally he summarizes by saying that we have completed our study of the infinite.