CHAPTER 6

THE CONTINUITY IN THE ORDER OF THE UNIVERSE

The argument against Origen brought us to a certain need for diversity for the perfection of the universe. The greater the diversity the more perfectly the divine perfection and goodness can be communicated to and represented in created things. But the perfection of the universe is something more than a matter of sheer diversity. In order to represent the divine goodness the universe also has to be one somehow. Diversity, however, can prevent unity. There can be diversity with such wide disparities that it makes unity all but impossible. Two things that are too unlike one another or too remote from one another do not tend to unite; they remain alien to one another. Thus, if the universe were made up of such disparate things only, its unity would be quite strained and it would be quite imperfect as universe. There is, as a matter of fact, a very great disparity between the extremes in the universe, but in between there are also many intermediates to connect the extremes through a series that goes gradually from one extreme to the other. This mediation of order is an essential aspect of the perfection of the universe. "Ad hoc quod universum sit perfectum,

nullus gradus perfectionis in rebus intermittitur, sed paulatim natura de imperfectis ad perfecta procedit" (In II De Anima lect. 5, n. 288).

The gradual passage from the lower to the higher in nature had long been acknowledged through observation. In his History of Animals, Aristotle presented a lengthy classification of animals on the basis of similarities and differences in their parts, organs, and functions, and at the end he formulated a principle of continuity that became more or less a common place in antiquity and in the middle ages. The principle was first stated in connection with higher animals where it appeared most strikingly. Certain psychic traits which were seen clearly in higher animals were also found in lower animals, but in a more inchoative and still confused way, somewhat as they are found in the child, which in many respects is still like lower animals. In the child these traits are destined to develop and become more distinct as the child approaches maturity.[1]

But in the eyes of Aristotle the principle had a broader application. In fact it applied to the whole of nature: nature proceeds little by little from things lifeless to animal life; after lifeless things in the upward scale comes the plant, relatively lifeless in comparison to the

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[1] Cf. the History of Animals VIII, 1: 588a18-b3. François Nuyens, L'évolution de la psychologie d'Aristote, pp. 155-158, analyses the significance of this text on continuity in the thought of Aristotle.

animal, but still living in comparison with the simply lifeless; in plants a continuous scale of ascent toward the animal was found and in animals a similar scale was also found, for some showed obvious signs of sensibility, whereas others indicated sensibility but indistinctly.[1]

In the treatise On the Soul, the idea was taken up again and the ascending scale of animal souls was compared to a series of figures that grew out of one another, each successive one containing its predecessor potentially, the sensory containing the self-nutritive as the square contains the triangle. The order of the series in souls was such that the more complex could not be found without the more simple, but the more simple could be found without the more complex. Thus the power of perception is never found without the power of self-nutrition, but the power of self-nutrition is found without that of perception, as in plants; and again, no sense is found apart from that of touch, while touch is found by itself; many animals have neither sight, hearing, nor smell.[2]

In this continuity of nature, what impressed St. Thomas most was the fact that the things which followed one another were also more similar than those that were more

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[1] History of Animals VIII, 1: 588b4-18. Cf. also Nuyens, op. cit., p. 157, note 35, and St. Thomas himself, In De Memoria et Reminiscentia lect. 1, n. 298.

[2] Cf. On the Soul II, 3: 414b28-414a12; St. Thomas, In II De Anima lectt. 5 and 6.

distant. "Gradus entium continuantur sibi invicem secundum quamdam similitudinem, unde ea quae sunt totaliter dissimilia consequuntur se invicem in ordine rerum per aliquod medium quod habet similitudinem cum utroque extremorum" (In De Causis lect. 31, n. 456). Similitude was thus a norm for order and there were many instances in nature to illustrate the point.

> Ita enim procedit ordo rerum ut similia se invicem subsequantur; ea vero quae sunt penitus dissimilia non se invicem subsequantur in gradibus rerum, nisi per aliquod medium. Sicut videmus quod animal perfectum et planta sunt dissimilia penitus quantum ad duo: nam animal perfectum est sensitivum et mobile motu processivo; planta autem neutrum horum habet. Natura ergo non procedit immediate ab animalibus perfectis ad plantas, sed producit in medio animalia imperfecta quae sunt sensibilia cum animalibus et immobilia cum plantis.
> (In De Causis lect. 30, n. 445)

As Aristotle had gone from animal natures to the whole of nature in formulating the principle of continuity, so also St. Thomas went from nature to the whole of the universe, including those beings that were above nature, souls, which transcend nature, in part at least, and separate intelligences.

> Huiusmodi autem ordines, cum ab Uno primo procedant, continuitatem quamdam habent ad invicem ita quod ordo Corporum attingit ordinem Animarum et ordo Animarum attingit ordinem Intellectuum qui attingit Ordinem Divinum. (In De Causis lect. 19, n. 352)

The fact that the different orders of reality "touch" one another is what brings about the similarities between neighboring kinds of being. Through this contact, as it were, something passes from the higher to the lower order, and the

lower has some part of what is found fully only in the higher.

> Ubicumque autem diversi ordines sub invicem coniunguntur, oportet quod id quod est supremum inferioris ordinis proppinquitatem ad superiorem ordinem aliquid participet de superioris ordinis perfectione. (Ibid.)

St. Thomas sees an indication of this in the fact that some animals, inferior to man, have something akin to reason, and some plants have something akin to a differentiation of sexes. Everything appears as if something rubbed off on the inferior from the superior through this "contact".

We shall have to examine the nature of this sort of "contact", but before we do, we must consider a more fundamental question. What does continuity have to do with the order of the universe? Is it something essential, or is it only incidental? If we consider only the fact of continuity in the order of the universe, perhaps the question could not be settled completely, though the consistency of the fact at all levels of nature and reality would certainly tend to make us think that such continuity is essential or natural. But if the fact be connected directly with the divine wisdom, then it begins to appear as essential, for, its origin, its ratio, is exactly the same as that of the order itself. For St. Thomas the continuity in the order of the universe flowed from the divine wisdom precisely in the same way as order itself.

The idea was found in Dionysius who had written

that, God is not only the cause of order in the universe, but He also brings together always what is last in one order and what is first in the next: "semper fines primorum (coniungit) principiis secundorum."[1] The idea was axiomatic with St. Thomas and was directly connected with that of creation. For St. Thomas, as for Dionysius, the divine wisdom is efficient cause of things by producing them in being, but it does not give being in any which way. "Ipsa divina Sapientia est omnium causa effectiva, inquantum res producit in esse et non solum rebus dat esse, sed etiam esse cum ordine in rebus" (In De Div. Nom. c. 7, lect. 4, n. 733). Thus what is produced concretely by creation is esse cum ordine in rebus, as St. Thomas is careful to specify, just as it is by the order of the whole universe that we come to know God.[2] Once this is understood, however, we have to understand also that this order has its mode, and this is what the Dionysian axiom expresses.

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[1] Text as given in the Marietti edition of St. Thomas's commentary on the De Divinis Nominibus, c. 7, n. 324, and as cited most frequently by St. Thomas himself.

[2] "Sed cognoscimus Ipsum ex ordine totius universi. Ipsa enim universitas creaturarum est nobis a Deo proposita ut per eam Deum cognoscamus, inquantum universum ordinatum habet 'quasdam imagines et assimilationes' imperfectas divinorum quae comparantur ad ipsas sicut principalia exemplaria ad imagines" (In De Div. Nom. c. 7, lect. 4, n. 729). We underline to bring out the importance of order and 'university' in the relation between creatures and God, the simply universal Cause of all things. The text of Dionysius has "ex omnium totorum ordinatione, sicut ex Ipso proposita et imagines quasdam et assimilationes divinorum Ipsius exemplarium habente, ad illud quod est super omnia et ordine secundum virtutem ascendimus..." (c. 7, n. 321). See also C.G. II, c. 2 and IV, c. 1.

> Modum autem huius ordinis subiungit, quia 'semper fines primorum,' idest infima supremorum, coniungit 'principiis secundorum,' idest supremis inferiorum, ad modum quo supremum corporalis creaturae scilicet corpus humanum, infimo intellectualis naturae, scilicet animae rationali unit; et simile est videre in aliis. (Ibid.)

It is St. Thomas who explicitly introduces the idea of mode, the proportion and measure in order, along with the illustration drawn from the place of man in the universe. Given the context, the fact that there is question here of something flowing directly from the act of creation, it hardly seems possible to speak of this mode as something incidental to the order in things. Continuity goes with the very being of things, since their being is a being-with-order and continuity belongs to order as its mode; it is an effect of divine wisdom: "effectus divinae sapientiae est" (De Pot. q. 5, a. 9, obj 11).[1]

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[1]According to St. Thomas, in the final state of the world, its state of perfection, there will be no mixts and no brute animals. This, it would seem, would mark the end of continuity in nature. "Hoc autem non erit si animalia et plantae desinant esse, quia elementa in nullo attingunt ad perfectionem humanam, ad quam attingunt quodammodo animalia; ad animalia vero appropinquant plantae; ad plantas vero corpora mineralia, quae immediate post elementa sequuntur." If only the elements and human bodies will remain of the things found on earth, what will become of the principle of continuity? The question is not without some importance, since the relation between the continuity of order and final perfection is at stake. In his reply he takes nothing away from the principle. "In ipso homine continuatio quaedam naturarum apparebit, in quantum in eo congregatur et natura corporis mixti et natura vegetabilium et animalium" (De Pot. q. 5, a. 9, obj. & ad 11). Apart from its escatological context, this text gives a clear indication of the central place man is given in the universe in the thought of St. Thomas. We shall see that, in the order of the universe sub motu existentis, man's place is no less central.

A good part of the Pythagorean error came from ignoring this continuity in the order of the universe. The Pythagoreans postulated a different principle for every different level of order, "dicentes cuiuslibet naturae esse alia et alia principia." By being satisfied with that, without taking into account the order between the different levels, and its continuity, they were leaving the universe disjointed: "sic dicentes, faciunt substantiam 'universi esse inconexam', idest sine ordine, ita quod una pars nihil conferat ad aliam vel ad alteram, sive sit sive non sit. Et similiter faciunt multa principia inconnexa" (In XII Metaph. lect. 12, n. 2661). Such disjointedness is a condition that goes against the tendencies of the beings that constitute the universe; it is an evil. "Non potest esse, quia entia non volunt male disponi. Dispositio entium naturalium est qualis optima esse potest. Et hoc videmus in singulis, quod unumquodque est optimae dispositionis in sua natura. Unde multo magis oportet hoc existimare in toto universo" (Ibid., n. 2662). If it is not good for an individual to be out of joint with himself, it is even worse for the universe as a whole, for the order within an individual is something that comes under the order of the universe, the esse cum ordine in rebus. The order of the universe does not prevent each level of reality from having its proper order, with its proper principles, but one level cannot be independent of the other. "Et tamen licet non sint eodem modo

ordinata, non ita se habent, quod unum eorum non pertineat ad alterum; sed est aliqua affinitas et ordo unius ad alterum" (In XII Metaph. lect. 12, n. 2632). It cannot be otherwise, since they all proceed from the same first Principle: "cum ab Uno primo procedant, continuitatem quamdam habent ad invicem" (In De Causis lect. 19, n. 352).

Here let us pause for a moment to dispel a possible misunderstanding concerning the nature of this continuity in the universe. We have spoken of a certain contact between the different levels of being, but contact is not continuity. Continuity says something more than mere contact. "Sed non sequitur, si tangit, quod sit continuum; sicut non sequitur quod si aliqua sunt simul, quod sint unum. Sed in quibus non est contactus 'non est nascentia', idest naturalis coniunctio, quae est proprie continuorum" (In XI Metaph. lect. 13, n. 2415). There can be no continuity without contact, but continuity itself implies a naturalis coniunctio over and above contact. It is not a mere juxtaposition, but it implies a closer unity. "Continuum est cum utriusque eorum, quae se tangunt, et quae simul sunt, sit unus et idem terminus, sicut partes lineae continuantur ad punctum" (Ibid., n. 2412).

There are different kinds of order in the universe, the order of dignity, the order of principles, but the first meaning of order for us is connected with local motion. "Ordo autem prioris et posterioris invenitur in diversis; sed

secundum id quod primo est nobis notum, est ordo inventus in motu locali, eo quod ille motus est sensui manifestior" (In V Metaph. lect. 1, n. 751). Our first understanding of continuity is likewise connected with sensible experience. There are three kinds of order tied together in local motion, the order of magnitude, the order of motion, and the order of time, and all three entail continuity.[1] From local motion, we extend our notion of continuity to other kinds of motion and change, and to bodies themselves. As applied to bodies, the idea of continuity becomes closely allied with that of substance. But if we are not to make the same mistake as R. G. Collingwood, if we are not to confuse the unity of order in the universe with a unity of substance,[2] in applying our notion of continuity to the universe as a whole, we must be careful to refine it somewhat more.

Two texts from St. Thomas will help us to do just this. There are two ways one thing may be constituted out of

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[1] In V Metaph. lect. 13 presents a succinct analysis of the meanings of order. Order of place, time, and space are seen as in rebus continuis, as opposed to order in rebus discretis, in things that are not continuous in the strict sense of the term. In the strict sense, continuity applies first to magnitude and, consequently, to motion and to time. "Sunt autem trium rerum ordines esse consequentes; scilicet magnitudinis, motus, et temporis" (In V Metaph. lect. 1, n. 751; cf. also lect. 13, n. 937). Motion has its continuity from magnitude, and time from motion. Beyond this, continuity has a broader meaning, as does order. "Ex ordine autem, qui consideratur in motu locali, fit nobis etiam notus ordo in aliis motibus..." (loc. cit., n. 754).

[2] Cf. supra, ch. 3, p. 111.

many, one in which a totality in the strict sense is constituted, and the other in which the many keep their individual identity.

> Quaecumque sunt constituta ex pluribus quod ex eis fiat unum commune, sive in plura sint coniuncta, sicut membra corporis coniunguntur ad constitutionem totius, sive sint divisa sicut ex multis militibus constituitur unus exercitus... (In I Polit. lect. 3, n. 61)

In either case there has to be an order, as can be seen even in sensible things, for in sensible things order can be found in two ways:

> uno modo secundum quod partes alicuius totius habent ordinem ad invicem, sicut in animali pars prima est cor, et in domo fundamentum. Alio modo secundum quod aliqua sunt consequenter se habentia, ex quibus non fit unum vel continuitate vel contactu. Sicut in exercitu dicitur prima acies, et secunda acies. (In XII Metaph. lect. 1, n. 2417)

Averroes did not think it possible to truly conceive the universe as a whole constituted of parts.[1] But St. Thomas saw the possibility clearly, as long as 'whole' or 'continuum' or unum commune were not understood in their first or purely sensible meaning, but in an extended or analogical meaning. This extended meaning will be seen if we consider the two analogies which we find in both the preceding texts, and which recur constantly under the pen of St. Thomas, together. Both are integral parts of his thinking. Each expresses a

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[1] Cf. Ibid., n. 2418. Averroes seems to labor under too restricted a notion of the analogy of being. Since being is not a genus, he cannot see how different beings can have a certain community and a certain continuity between them, something more than a mere being-next-to one another.

different aspect of the unum commune which the different beings of the universe constitute.

The analogy with the animal, or any sensible whole, such as a house even or any other artefact brings out, the unity in being of all creatures, their esse cum ordine, by which, in the most intimate part of themselves, they are inserted in the order of being as parts in a whole. This insertion, however, does not destroy their particular identity. On the contrary, it presupposes it and, as it were, solidifies it. They remain divisa and discreta, but not in isolation. Some are higher and some are lower; some are first in some respects, others are last, and still others are in between. From these differences come the activity and the passivity and the various kinds of interaction that tend toward the unity of the final perfection of the universe. The unity of the universe is not a unity of being, but a unity in being. But it is a unity of action between a diversity and multiplicity of beings, a cooperation, a working together of all things toward their final end: "esse cum ordine in rebus, inquantum res invicem se coadunant in ordinem ad ultimum finem" (In De Div. Nom. c. 7, lect. 4, n. 733). This is why the analogy with the army has to come to complete the first analogy, for, whatever continuity exists between the parts of the universe, it is there for their conspiration under the Lord or the Ruler of universe. "Et sic operatur pulchritudinem universi per 'unam

omnium conspirationem,' idest concordiam et 'harmoniam,' id-est debitum ordinem et proportionem" (Ibid.).

To illustrate the Dionysian axiom of continuity St. Thomas used the body of man seen as the summit of corporal nature and his rational soul seen as the lowest degree of intellectual nature, both united in one kind of substance. In C.G. II, c. 68, where the question arises of showing how it is possible for an intellectual nature to be the form of a body, "qualiter substantia intellectualis possit esse forma corporis," he falls back on the principle of continuity, bringing out how well such a union goes with the order of things in the universe, and in so doing he gives a brief sketch of the continuity. It would be good for us to consider this sketch at this point.

After showing how matter and form unite to form one substance, and how an intellectual substance is not prevented from being the substantial form in a composite by the fact that it is subsistent, St. Thomas raises the difficulty that an intellectual substance is of a different genus and a different mode of being from a material body and so cannot communicate its being to matter in the unity of one being. "Potest autem obiici quod substantia intellectualis esse suum materiae corporali communicare non possit, ut sit unum esse substantiae intellectualis et materiae corporalis: diversorum enim generum est diversus modus essendi; et nobilioris substantiae nobilius

esse" (n. 1451). The difficulty would, indeed, be insurmountable, if the being of matter were on a par with that of an intellectual substance. But such is not the case.

> Non est autem ita. Est enim materiae corporalis ut recipientis et subiecti ad aliquid altius elevati: substantiae autem intellectualis ut principii, et secundum propriae naturae congruentiam. Nihil igitur prohibet substantiam intellectualem esse formam corporis humani, quae est anima humana. (n. 1452)

It is the proper of matter to be recipient of perfection and subject to being elevated to something higher by form.

It is after recalling this peculiar nature of matter, and of the relation between matter and form, that St. Thomas brings the principle of continuity into consideration. Given the fact that, in the order of the universe, the lowest of a higher genus reaches to the highest of a lower genus, as we see in the order of animals and plants, it is to be expected that something in the genus of bodies will reach to what is lowest in the genus of intellectual substances. "Est igitur accipere aliquid supremum in genere corporum, scilicet corpus humanum aequaliter complexionatum, quod attingit ad infimum superioris generis, scilicet ad animam humanam, quae tenet ultimum gradum in genere intellectualium substantiarum, ut ex modo intelligendi percipi potest"[1] (n. 1453a). Since man is

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[1]The last phrase of this text is an allusion to the discursive mode of human understanding, as opposed to the more simple mode of superior intelligences. St. Thomas analyses the difference between these two modes of understanding elsewhere, and he frequently presents it in the light of the continuity principle. Cf. De Ver. q. 8, a. 15, q. 15, a. 1; q.

constituted of an intellectual substance, on the one hand, and of a material body, on the other, two very different kinds of reality, we might be inclined to think that he is less one than certain more simple bodies, especially since the human body is itself quite complicated and rather fragile as compared to others. But that would be to stop short in our understanding of unity at only a sensible perception, at a consideration only of matter as such. Despite its complexity, the human body is superior to more simple bodies, and hence more one, by reason of its form, which is principle of unity. It is also more one with its form, with the human soul, because in the composite, man, form overcomes the dispersion of matter better than in any other composite. Quanto forma magis vincit materiam, ex ea et materia efficitur magis unum (n. 1453c).

We shall understand this better if we follow St. Thomas as he elaborates the order in which form progressively takes hold of matter. Form, it must be remembered, is both principle of being and principle of activity; the order will therefore have to be seen both in terms of degrees of being and in terms of activity. St. Thomas begins by noting that, though the being of form and matter in a composite is one, it does not necessarily follow that matter is always equal to the

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16, a. 1; In De Div. Nom. c. 7, lect. 2, nn. 711-713. These texts show the continuity that links man with the beings superior to himself. The text we are now studying analyses the continuity that links what is below man in nature to man himself, the being in whom matter and spirit meet.

form; in fact, the higher a form is, the more its being exceeds matter. The proof of this appears in the activity of things.

> Quod patet inspicienti operationes formarum, ex quarum consideratione earum naturas cognoscimus: unumquodque enim operatur secundum quod est. Unde forma cuius operatio superexcedit conditionem materiae, et ipsa secundum dignitatem sui esse supercedit materiam. (n. 1454)

The victory over matter must therefore be understood both at the level of activity and at the level of being, the former being the sign of the latter, and the latter being the principle of the former.

At the lowest level of forms, that is to say, in the elements, and even in the merely mineral order of mixts, there is no activity that goes beyond the dispositions of matter. Hence these forms are entirely material and totally immersed in matter: "omnino materiales, et totaliter immersae materiae." Here the matter is equal to the form. But above this level there are forms whose activity extends to some results that exceed the virtue or the power of the qualities proper to matter as such, even though their activity needs the organic collaboration of the latter. These are the souls of plants which are principles of some movement in living things, things that can move themselves and that are not moved only by others. Above this level still there are other forms that are not only principles of movement in things that move themselves, but also principle of knowing <u>aliqualiter</u>:

the souls of brute animals. In their operation of knowing these forms do not need the organic collaboration of the basic qualities of matter; they are relatively immaterial, above matter in this respect, though their operations are not perfected without the mediation of a corporal organ. "Sentire enim et imaginari non completur calefaciendo et infrigidando (something that could be said of generation and nutrition, which are already present at the purely vegetative level); licet haec sint necessaria ad debitam organi dispositionem."[1]

Finally, above all these there is the form that resembles superior substances, which are separate from matter, even according to the genus of knowledge, the human soul.

> Super omnes autem has formas invenitur forma similis superioribus substantiis etiam quantum ad genus cognitionis, quod est intelligere: et sic est potens in operationem quae completur absque organo corporali omnino. ... nam intelligere non fit per aliquod organum corporale. Unde oportet quod illud principium quo homo intelligit, quod est anima intellectiva, et excedit conditionem materiae corporalis, non sit totaliter comprehensa a materia aut ei immersa, sicut aliae formae materiales. Quod eius operatio intellectualis ostendit, in qua non communicat materia corporalis. (n. 1459)

St. Thomas goes on to explain that, since the understanding of the human soul needs powers such as the imagination and the senses, which are tied to certain corporal organs, it follows that the soul is united to the body according to its nature, to complete the species of man, "naturaliter unitur corpori ad

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[1] Concerning the immateriality of all knowing, even sensible knowing, cf. S.T. I, q. 14, a. 1, c; In II De Anima lect. 5, n. 284; lect. 24, nn. 551-554.

complendam speciem humanam." But this does not prevent the human soul from overcoming matter, vincit materiam, in a way that transcends all other forms in composition with matter. It only specifies the manner of this victory, for the human soul does not rise above matter to be entirely free of it, as we can suppose separate substances are, but to dominate and take hold of it in order to give it a more human aspect.

All other forms, at lower levels, conspire, under man, in this, by reason of their place in the order of the universe and according to the measure of their capacity. Such is the exigency that flows from the principle of continuity. We shall not go into the details of this conspiration as St. Thomas saw them. Many of them belong to a rudimentary form of chemistry and biology and they are no longer of much interest. We shall, however, consider the order of this conspiration at three different levels, the order of place, the order of generation, and the order of reason and intelligence, for it is under these aspects that the cosmology of St. Thomas remains of great interest today. Each one of these levels permits a certain grasp of the world as a totality, but, as we shall see, the first brings us to the second, and the second to the third, and it is only with the third, presupposing and assuming the first two, that we have a complete grasp of the world as a totality.

CHAPTER 7

THE ORDER OF SITUS IN THE UNIVERSE

In the Aristotelian view of nature the order of Situs had a very prominent role to play, a role somewhat analogous to the order, or disorder, as the case may be, of atomic particles in contemporary physical theory. The order of place was, in fact, what made possible the first conception of the universe as a whole on the basis of something that was common to all bodies. Natural science began with the eight books of the Physics, but these dealt only with generalities such as motion and mobile being according to their absolute form, "secundum formam absolutam," and not "secundum applicationem formae ad materiam;" they dealt with the communia naturae, with our common notions of mobile being as mobile, but not precisely with motion as found in the things of nature nor with the things themselves.[1] The

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[1]Cf. In De Caelo Procem., nn. 2(2)f. Friedrich Solmsen, in Aristotle's System of the Physical World, contrasts the Physics with the rest of Aristotle's works in the philosophy of nature in much the same way as St. Thomas does: "It may be argued that the Physics itself remains on a rather high level of generality and seldom descends to specific statements about the phenomena of the Cosmos... Yet even the Physics stays within the area of perishable phenomena; it clarifies concepts applicable only to these, and it deals with conditions and characteristics of physical objects without contrasting them with the properties of

application to matter, to the proper subjects of motion and change, to magnitude and to bodies, began properly only with the next part of natural science, the De Caelo, and it began with a consideration of the universe as a whole. What made such a consideration possible was an order of place arrived at through an analysis of local motion as found in what were considered to be the fundamental constituents of the universe, the four elements here below and the heavenly bodies above. "Constituitur autem universum corporeum ex suis partibus secundum ordinem situs" (In De Caelo Prooem., n. 5).

The idea of an order of place in the universe is somewhat strange to us today. We are more accustomed to think in terms of a Newtonian space, conceived as infinite and empty, or at least as anterior to bodies, and hence as outside the question of order or disorder. "In dimensionibus spatii separatis nullus ordo naturae considerari potest" (In IV Phys. lect. 8, n. 492(6)). Aristotle did not think of space in this way. His way of seeing was closer to the modern idea of a curved space which requires the presence of

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things eternal... We have made an attempt to distinguish between 'physical' and 'cosmological' topics. Physics crystallized through the discussion and questioning of some vital concepts that had been implied or taken for granted in the beginnings of cosmology. A clear understanding of these concepts and of their legitimate and illegitimate use had become a prior condition for new ventures" (p. 70).

matter to manifest itself.[1] For him, space was the space occupied by a body and it did not come before the body itself, although we could imagine it that way. Situs, on the other hand, was something more, for it implied order of some kind within the place.

Place could be conceived absolutely to a certain extent, that is, independently of order. We can speak of where a thing is, of its place, for example, without considering how it is situated with respect to anything else. But place in the complete sense of the term includes situation, an order of parts: "(situs) addit supra 'ubi' ordinem partium in loco" (In III Phys. lect. 5, n. 322(15)). According to Aristotle there was an order of place in the universe determined by nature itself and it was the object of the De Caelo to study this order. The model that he presents us is, of course, superceded. Modern science has broken down what he considered the simple bodies into far simpler particles

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[1] The connection may seem only verbal, but it is interesting to note Aristotle's use of simitas, curved-nosedness, as an example of something that can be found only in matter. A curve can be defined without reference to sensible matter, as in mathematics. But curves are not found except in matter and a curved nose cannot be defined without including matter: "et talia sunt omnia naturalia, ut homo, lapis..." (Cf. In I Phys. lect. 1, n. 2(2)). Newtonian space has been recognized to be no more than an abstraction, something imagined and projected as an objective reality. This does not mean that the question of a finite or infinite space has been settled, but it does imply that the Newtonian approach to it which proceeds independently of bodies will no longer do. The question must be dealt with in connection with the constituents of physical reality and the order between them.

and it has probed far beyond his seven spheres. It has discovered forces and distances which he did not even suspect existed. Yet in the De Caelo Aristotle did something which resembles many a modern cosmology, in outlook if not in results, for he worked out a theory of the whole that ranged from the heavens to the elements much in the way that modern cosmology ranges from astrophysics to nuclear physics.[1]

Among the ancient commentators of Aristotle, St. Thomas found a variety of interpretations as to the precise subject of the De Caelo et Mundo. Some said the book dealt with the heavenly bodies principally. Others said it dealt rather with the simple bodies as such. But for St. Thomas, as for Alexander, the subject of the book was the universe itself and what pertained to it as such: "ipsum universum, quod dicitur 'caelum' vel 'mundus'; et ... de simplicibus corporibus determinatur in hoc libro, secundum quod sunt partes universi" (In De Caelo Procem., n. 5(5)). Since the corporal universe is constituted by its parts according to an order of place, as we saw before, it follows that the book deals directly only with those parts of the universe

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[1]Cf. Jagjit Singh, Great Ideas and Theories of Modern Cosmology, who begins by discussing astrophysical theories as an approach to cosmological theories, while making the discussion depend all the way through and ultimately on nuclear theory (cf. especially ch. 13, "Nuclear Physics and New Cosmology"). D. W. Sciama, The Unity of the Universe, while following a different plan, ranges no less from galaxies and nebulae to elementary particles.

which have a place primo et per se in the universe: "et ideo de illis solum partibus universi determinatur in hoc libro, quae primo et per se habent situm in universo, scilicet de corporibus simplicibus" (Ibid.). Such things as rocks, plants and animals, which are parts of the universe, but which are not simple bodies, do not have their situs in the universe of themselves, but rather from the simple bodies that compose them, and hence they do not enter into the subject of this book. Nor does every aspect of the simple bodies, such as hot or cold or anything of that nature, enter, but only what has to do with place, the situs of the elements which is determined according to gravity and levity.[1] The heavenly bodies entered in, of course, because they were the simple bodies par excellence in the view of Aristotle. The first part of the book is devoted to proving their existence as the fifth simple body, the 'quint-essence'.

Two important distinctions have to be understood clearly in this explanation of what precisely the De Caelo is about. First, local motion must be distinguished from all other kinds of change, such as qualitative change or substantial change, or as St. Thomas puts it, in a division of the kinds of change found in nature, from "alterationes et transmutationes in invicem, quae sunt secundum generationem et corruptionem" (In III De Caelo lect. 1, n. 547(4)).

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[1]Cf. In I De Caelo lect. 6, n. 68(11); In II De Caelo lect. 4, n. 336(7).

Local motion is not generation nor corruption nor anything like them. In the ancient view the latter were found only in the things of earth, and not in the heavenly bodies. Heavenly bodies were thought to be unchangeable in themselves and incorruptible, and subject only to local change. Hence, only local motion was thought to be absolutely common to all the bodies of the universe. That is why it had such an important place in Aristotle's speculation on the universe. The De Caelo prescinds from every other sort of motion in constructing its basic model of the universe.[1]

Aristotle's supposition concerning the heavenly bodies has been found to be false, but it still remains true that at least local motion is common to all bodies. In fact, some will say that it is the only 'real' change that takes place in nature, minimizing qualitative and substantial change. This is what gives a certain interest to the De Caelo even today, for, though the model it presents is obsolete, it gives an example of how to begin a theory of the universe with only what is minimal, the lowest common denominator of all things in nature, and to arrive at a global view without excluding higher points of view.

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[1]According to its first meaning, cosmology is that part of the philosophy or the science of nature which deals with bodies as a whole, with what is common to all bodies. It is not, however, the whole of the science of bodies, since there are certain aspects of at least certain bodies which it will not consider, such as life in living bodies, for example, something which is not common to all bodies, and hence which does not enter into cosmology as such.

The second distinction is connected with the first, but it has more to do with the nature of the bodies themselves and it brings out the radical meaning of nature for an Aristotelian. In distinguishing the kinds of beings found in the universe, Aristotle and St. Thomas are often careful to set those that have something more than mere nature off from those that are merely natural.

> Eorum quae sunt secundum naturam, quaedam sunt corpora et magnitudines, sicut lapides et alia inanimata; quaedam habent corpus et magnitudinem, sicut plantae et animalia, quorum principalior pars est anima (unde magis sunt id quod sunt secundum animam quam secundum corpus). (In I De Caelo lect. 1, n. 7(2))

In its radical meaning nature refers simply to body, and it is the principle of motion proper to body as such, which for Aristotle meant motion ad locum. Mere nature implies only an order to place, and in the bodies of earth it implies order to one place only.[1] In the mind of Aristotle this kind of natural substance includes principally and primarily the simple bodies, such as the four elements, and secondarily, in dependence of the elements that compose them, the inanimate compounds such as rocks and metals. It also includes the fifth simple body, totum caelum et partes eius. All these together are distinguished from living compounds, corpora mixta animata, sicut animalia et plantae et partes eorum.[2]

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[1] Cf. In I De Caelo lect. 17, nn. 165(2)-168(5).

[2] Cf. In III De Caelo lect. 1, n. 547(4). Aristotle held that the heavenly bodies were animated, but this did not lead him to consider them in the same manner as the living

This, of course, does not mean that living things do not belong to nature. In the first place, though they are not simply body and magnitude, as St. Thomas put it, they do have body and magnitude, and inasmuch as they do they do not behave differently from other bodies. They are subject to the same order that governs simple and inanimate bodies. What sets them apart is a principle of higher order, an order that pertains not so much to place but to activity. "Natura membrorum hominis vel cuiuslibet animalis non determinatur secundum ordinem ad aliquem locum, sed magis secundum ordinem ad aliquem actum; talis autem situs partium animalis congruit decentiae operationis membrorum" (In I De Caelo lect. 17, n. 168(5)). The order of place serves the order of life, but the order of life has a principle that is above mere nature. In a sense, soul, the principle of life, is a principle of nature, inasmuch as it is a principle of things that have body and magnitude, of things found in nature,

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mixts. Notwithstanding their being animated somehow, for him they were still simple bodies and as such they were essential parts of the physical world. This is the light in which they are considered in the De Caelo. As for St. Thomas, though he sometimes speaks as if the heavenly bodies had souls, he does so without committing himself to such a position. "Quae autem diximus de Animabus caelorum, non asserendo diximus, sed aliorum opiniones recitando" (In De Causis lect. 5, n. 157). St. Thomas himself inclined to think the heavenly bodies did not have souls, but he did not take a firm stand on the matter; cf. De Pot. q. 6, a. 6, c. This, however, did not keep him from going along with both Plato and Aristotle in saying that they were directed by intelligences, some of them certainly separate; cf. Ibid.; In II De Caelo lect. 3, nn. 314(2)f; lect. 18, n. 458(1); S.T. I, q. 70, a. 3, c; C.G. III, c. 23.

but it is not nature simply. "Et quod hoc principium non sit natura sed anima, manifestum est. Nam natura non movet ad contraria loca: motus autem augmenti et decrementi est secundum contraria loca. Augentur enim vegetabilia omnia, non solum sursum et deorsum, sed utroque modo" (In II De Anima lect. 3, n. 257).

With this it becomes clear that no theory of the universe will be adequate unless it includes an account of the order of life. But it also appears that the theory can reach a certain degree of completeness in dealing with only the order of place or with body as such. In our second chapter, in connection with perfection and this universe, we saw how such an idea was arrived at. A particular body is perfect because it has all of the three dimensions, but it is still imperfect inasmuch as there are other bodies outside of it which are there as a term. One body appears as limiting the other. But the universe is perfect in every way because it has all dimensions and includes in itself all bodies.[1] Though life transcends body as such, this holds true even of living things, for they too "have" bodies and through these they enter into this first perfection of the universe, without however being reduced to it. With other bodies, they are parts of the corporal universe.

The method of the De Caelo combines experience with

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[1] Cf. In I De Caelo lect. 2, nn. 17(10)f; and supra, ch. 2, p. 70.

a few basic assumptions. As we read the book today we are tempted to reflect that the reasoning is rather a prioristic and out of touch with reality. But the ancients actually saw the world differently from the way we do, and if we are to do them justice, we must endeavor to appreciate how they experienced the world. Above, they saw a heaven of fixed stars and a series of planets moving in a circular motion about the earth. Aristotle's theory of the heavenly bodies sought to explain this, to find its rationes naturales, and, to the extent that he succeeded in elaborating a coherent theory of the heavens, an explanation of what Eudoxus and other astronomers said to be the result of their observations, he tended to reinforce the impression that everyone had. But it must not be forgotten that he started from the experience, and not from the theory. In his commentary, St. Thomas brings that out clearly, for, where the Philosopher mentions two principles presupposed in his argument to show the existence of the heavenly bodies as a fifth kind of simple body, to wit, that a violent motion or one that is praeter naturam is the contrary of a natural motion (for example, earth moves downward according to nature, but upward against nature), and secondly that one thing is opposed to only one contrary, St. Thomas adds that we must further presuppose something which appears to the senses, to wit, that there is a body whose motion is circular. "Oportet autem et tertium supponere,

quod sensu videtur, scilicet esse aliquod corpus circulariter motum" (In I De Caelo lect. 4, n. 38(6)). Without mentioning it explicitly, Aristotle's argument clearly started from what was taken as 'fact' of experience, at least as St. Thomas understood it.

The argument then states that this circular motion, which is seen as one of the simple motions, is either natural for the body we see moved in this way or violent for it. If it is natural, then the point is made that there exists a simple body other than the four elements (whose natural motion is rectilinear), since simple motions are proper to simple bodies and circular motion is clearly a simple motion other than the linear motion proper to any of the four elements. If it is not natural, however, it is against nature, which means that it is either contrary to some one of the natural rectilinear motions in one of the four elements--which is impossible, since only one contrary is opposed to an other and any given one of the natural rectilinear motions already has its contrary apart from circular motion, or else it is contrary to the natural motion of some other body besides the four elements--which is also impossible, since this other body would be like one of the four elements, in that it would have an opposite whose motion is contrary to its own, and this would bring us back to the first impossible supposition. We are left with the conclusion that there

has to be a body whose natural motion is circular, the body that is seen to move circularly.

In the course of his commentary St. Thomas later reiterates this appeal to sensible experience concerning the heavenly bodies more than once: "corpus quod ad sensum circulariter movetur... istud corpus quod videmus circulariter ferri" (In I De Caelo lect. 4, n. 49(17)). "Ad sensum videmus quod caelum circulariter movetur" (lect. 9, n. 101(8)).[1] But the appeal to experience is not limited to this phenomenon only. In his divisions of the text, St. Thomas brings out the two kinds of arguments Aristotle appeals to frequently: rationes naturales et signa. The argument for the incorruptibility of heavenly bodies thus appeals first of all to systematic reasons and then points to indications taken from the secular experience of man.[2] The discussion of the place, the

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[1] Cf. also lect. 10, n. 103(2); 105(4); lect. 11, nn. 108(3)f. We mention texts that have to do with heavenly bodies. Many more could be found all the way through St. Thomas's commentary that constantly remind us of this reference to sensible experience for practically every aspect of the Aristotelian system. Especially worth noting is a criticism of the Pythagorean method for not following sensible experience but for seeking to impose its preconceived ideas on it: In II De Caelo, lect. 20, n. 482(4), and a discussion of two ways of proceeding in natural science, the 'logical' way that attends more to ideas, "communibus rationibus," and the 'natural' way that attends more to the sensible things themselves: In I De Gen. lect. 3, n. 25(8).

[2] Cf. In I De Caelo lect. 6, n. 58(1). The appeal to secular experience itself begins lect. 7, n. 75(5), and recalls the custom of thinking of the heavens as the proper place of the gods, the fact that no change other than local

immobility and the figure of the earth similarly appeals first to natural reasons and then to signa astrologica.[1] And even the idea, the supposition, that simple bodies have a natural motion and a natural place of rest, at least as far as the four elements are concerned, and that violence, with regard either to motion or to rest, is the opposite of nature, is found to spring from experience: "Videmus enim ad sensum corpora simplicia moveri: si ergo non habent proprium motum sibi naturalem, necesse est quod moveantur per violentiam" (In III De Caelo lect. 5, n. 576(2)). "Videmus ad sensum aliquod corpus quiescere in medio, puta terram aut lapidem: ergo, secundum praemissa, aut quiescit per violentiam, aut secundum naturam" (n. 577(3)).

The system, however, went beyond the ordinary way of

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has ever been observed in the heavenly bodies from the memory of man, and finally that the very name, heaven, indicates incorruptibility. St. Thomas adds the critical remark that secular experience, such as it is, is not the last word. "Nec tamen hoc est necessarium, sed probabile. Quanto enim aliquid est diuturnius, tanto maius tempus requiritur ad hoc quod eius mutatio deprehendatur; sicut transmutatio hominis non deprehenditur in duobus vel tribus annis, in quibus deprehenditur transmutatio canis, vel alicuius alterius animalis breviorem vitam habentis. Posset igitur aliquis dicere quod, etsi caelum sit naturaliter corruptibile, est tamen tam diuturnum, quod totum tempus cuius memoria potest haberi, non sufficit ad deprehendendam eius transmutationem" (n. 76(6)). The remark manifests an awareness of the limitations inherent in observation. Turned around to apply, not to macrocosmic, but to microcosmic intervals of time and space, it would be not unlike what, in modern physics, has led to indeterminacy principles.

[1] Cf. In II De Caelo lect. 26, n. 521(1).

thinking, especially as concerns the heavenly bodies. St. Thomas was aware that the Philosopher's scientific views were not those of the common man. For example, men ordinarily spoke of the heavenly bodies as being above, but in the Aristotelian system this could not be said in the strict sense of the term, for, above was the proper place of fire, one of the four elements. 'Above' is 'away from the center' and the heavenly bodies are 'around' the center, not 'above'. They have a circular motion and they contain all other bodies. They are said to be above by association with fire, which is the element nearest to the heavenly bodies.[1] In the Summa Theologiae St. Thomas repeatedly calls upon such a distinction as this between the common way of seeing things and scientific systems when discussing the text of Genesis. He presents Moses as using the common views of the time when he wrote and then tries to interpret the text in terms of one cosmological system or other found among the philosophers.[2]

At this point we might ask why such prominence was given to the heavenly bodies in this system of the physical world. The answer would lie partially in the common conception of these bodies at the time, but it would also lie in a reason that is more properly scientific. The greater

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[1] Cf. In II De Caelo lect. 1, n. 292(5).

[2] Cf. S.T. I, q. 61, a. 1, c; q. 67, a. 4, c; q. 68, a. 3, c; q. 66, a. 1, ad 1 (first series) & ad 3 (second series); q. 68, a. 2, ad 3; q. 70, a. 1, ad 3.

stability of the heavenly bodies seemed more likely to guarantee our knowledge of physical reality than the changing things about us. This was the argument proposed against those who said everything was in flux and consequently that any and all appearances were true.

> Totaliter inconveniens est sumere iudicium de tota veritate ex hoc, quod ista sensibilia quae sunt prope, scilicet vicina nobis, permutantur et nunquam permanent. Oportet autem magis venari verum ex his, quae semper se habent eodem modo, et non patiuntur aliquam permutationem quantum ad substantiam suam, licet appareat in eis motus secundum locum. Talia enim sunt "quae continent mundum", scilicet corpora caelestia.
> (In XI Metaph. lect. 6, n. 2233)

The four elements could not be broken down into simpler bodies according to the ancients, but they still could be changed one into the other. Hence, of themselves, they could not assure the stability of order in nature. The heavenly bodies, on the other hand, were not absolutely immutable, but they were subject to the least change of all.

> Minimum habet de motu. Movetur enim solum motu locali, qui nihil variat intrinsecum rei. Et inter motus locales habet motum circularem, qui etiam minimum variationis habet: quia in motu sphaerico totum non mutat suum ubi subiecto, sed solum ratione, ut probatur in VI Phys.; sed partes mutant ubi diversum etiam subiecto.
> (In I De Caelo lect. 6, n. 64(7))

Thus it was that the heavenly bodies came to represent the most stable element of nature, the medium naturae in universo, not in the sense of medium magnitudinis, for this was a place occupied by the earth, the most material and least noble of bodies, but in the sense of "medium rei secundum naturam, per

quod scilicet natura rei conservatur: sicut videmus in animalibus quod non est idem medium a quo natura animalis conservatur, quod est cor, et quod est medium quantum ad corporis magnitudinem, quod est magis umbilicus. Et ita est etiam aestimandum in toto caelo, idest est in toto universo" (In II De Caelo lect. 20, n. 485(7)).

But this capital function of the heavenly bodies was not something immediately given in the Aristotelian system. It was something arrived at through the application of certain hypotheses to what seemed to be given in experience. What were these basic hypotheses? The first stemmed directly from the idea of nature. In Book II of the Physics nature is defined as principle of motion in the things in which it is found. Now, since the first motion of all, the motion without which there is no other motion, whether it be quantitative or qualitative, is local motion, as is shown in Book VIII of the Physics, it follows that all the bodies found in nature, which have their principle of motion in themselves, have a natural local motion. It was not necessarily so with regard to other kinds of change, for not all things that change according to place change according to quantity or quality as well, but all other changes presuppose local change.[1]

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[1] Cf. In I De Caelo lect. 3, n. 21(3). The references to the Physics are In II Phys. lect. 1; In VIII Phys. lect. 14.

There are many kinds of local motion: some circular, some rectilinear, and some, mixtures of these two. There are, however, only two kinds of simple motion, namely, circular and rectilinear. Aristotle argues to this from the fact that there are only two simple magnitudes, straight and circular, for the kinds of local motion are specified according to places just as any other kind of change is specified according to its term.[1] Rectilinear motion is further divided into motion sursum and motion deorsum, the two being opposed to one another. Thus we have three simple motions which Aristotle describes through their relation to the middle of the world, per habitudinem ad medium mundi: one is away from the center, the other is toward the center, and the third is around the center. The first is upward motion and belongs to light bodies; the second is downward motion and belongs to heavy bodies; the third is circular and belongs to heavenly bodies. But this last proposition on the circular motion of the heavenly bodies has to be demonstrated in order to show that heavenly bodies constitute a fifth kind of simple body. The thing to note right now is that there are only three kinds of simple motion and that simple motions are proper to simple bodies.

Different kinds of motion and change are proportionate to the different kinds of bodies which move and change.

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[1]Cf. In I De Caelo lect. 3, nn. 23(5)ff.

There are some bodies that are simple, and some that are complex. But the simple bodies are those of which it can most properly be said that nature is the principle of motion in them. "Simplex autem corpus est quod habet principium alicuius naturalis motus in seipso; sicut patet de igne, qui est simpliciter levis, et de terra, quae est simpliciter gravis" (In I De Caelo lect. 3, n. 32(11)). Consequently, it follows that no complex body will have in itself, according to its proper nature, the principle of some simple motion. If, therefore, circular motion is a simple motion other than the two contrary rectilinear simple motions, it has to belong to a simple body other than the four elements, and different from them.[1] As a simple motion, circular motion has to belong primo et per se to a simple body.

Aristotle argues from these premises and proposes five arguments, which St. Thomas comments at great length,

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[1]How precisely four elements are linked with only two simple motions will not detain us here. The existence of four elements is something which Aristotle accepted from Empedocles and Plato. The primary concern in Book I De Caelo, as we said before, was to establish the heavenly bodies as simple bodies different from the four elements, something that was original with Aristotle, as St. Thomas noted in S.T. I, q. 66, a. 2, c. The differences between the four elements were seen largely in terms of the fundamental qualities, cold and hot, dry and moist, (cf. In II De Caelo lect. 4, n. 338(9); In II De Gen. lect. 2--the latter, be it noted, is not from the pen of St. Thomas) but for each, since they were all simple bodies, there was a proper local motion ad situm, the two intermediaries, water and air, one near each extreme, earth and water, constituting a sort of continuity between them (cf. In I De Caelo lect. 4, nn. 34(2)f; lect. 5, n. 55(5)).

to show that such a motion is natural to the heavenly bodies,[1] and from there the Philosopher goes on to show how the heavenly bodies differ from the bodies here below, with regard to both gravity and levity, for they can be neither heavy nor light, since gravity and levity go with the other two simple motions, and how they cannot be subject to any change other than local motion, since there is no contrariety in them as there is in the four elements.[2] The argument is brought to completion by showing that, besides these five simple bodies, the integrity of the universe requires no other, for there can be no motion contrary to circular motion which would be natural to some other body besides the five mentioned.[3]

These are the broad lines of the way in which Aristotle arrived at his conception of the first perfection of the physical universe, starting from experience and a few basic assumptions concerning natural movements. "Et ita integritas universi ex istis quinque corporibus consistit" (In I De Caelo lect. 8, n. 78(1)). What we have brought out, it is hoped, is enough to make clear the rationale behind this basic model of the universe. From its point of view, complex bodies, such as animals and plants, appear as derived and secondary parts of the universe. "Animalia et plantae et alia huiusmodi sunt secundariae partes eius,

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[1] In I De Caelo lect. 5.

[2] lectt. 6 and 7.

[3] lect. 8.

quae magis pertinent ad bene esse ipsius quam ad primam eius integritatem" (lect. 3, n. 19(1)).

The thing to note especially in this model is the special status attributed to the heavenly bodies. Plato and all the other philosophers before Aristotle had held that all bodies, including the heavenly bodies, were of the same nature as the four elements.[1] But Aristotle did not go along with this.

> Hanc autem positionem Aristoteles reprobat, per motus naturales. Cum enim corpus caeleste habeat naturalem motum diversum a naturali motu elementorum, sequitur quod eius natura sit alia a natura quattuor elementorum. Et sicut motus circularis, qui est proprius corporis caelestis, caret contrarietate, motus autem elementorum sunt invicem contrarii, ut qui est sursum ei qui est deorsum; ita corpus caeleste est absque contrarietate, corpora vero elementaria sunt cum contrarietate. Et quia corruptio et generatio sunt ex contrariis, sequitur quod secundum suam naturam corpus caeleste sit incorruptibile, elementa vero corruptibilia. (S.T. I, q. 66, a. 2, c)

Though everybody admitted the incorruptibility of the heavenly bodies, Aristotle thus went far beyond his predecessors in asserting a difference of nature for them, founding their incorruptibility.[2]

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[1] Some said the heavenly bodies were composites of the elements, others that they were not composite but simply one of the elements, as Plato, who said they were fire. Cf. S.T. I, q. 68, a. 1, c.

[2] The others explained their incorruptibility only through extrinsic causes, Empedocles, by the absence of strife, and Plato, by the will of the Maker. Cf. S.T. I, q. 66, a. 2, c; q. 68, a. 1, c.

This difference of nature made them far removed from us not only in distance, but much more in the knowledge we have of them, "elongata non tantum distantia, sed multo magis eo quod pauca accidentium eorum cadant sub sensum nostrum... accidentia caelestium corporum sunt alterius rationis, et omnino improportionata accidentibus inferiorum corporum..." (In II De Caelo lect. 4, n. 332(3)). The things we are best fitted to know are the things around us, but in the Aristotelian view the heavenly bodies somehow transcended the nature of these things. "Ea vero quae totaliter nostris sensibus offeruntur sunt inferiora corpora cum quibus superiora corpora in essentiae specie non conveniunt nec in naturae conditione; conveniunt autem in ratione quantitatis, luminis et eorum quae ad haec sequuntur.[1] ... propriam autem naturam

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[1]This last remark is to assure a certain community between earthly and heavenly bodies, in spite of their difference, and hence the possibility of a certain knowledge of the heavenly bodies starting from observation. In commenting the De Caelo St. Thomas rejects as expressive falsum any suggestion that we do not actually see the heavenly bodies, but only some kind of glow emanating from them, "velut illustrationem quandam ipsorum." Such a position would imply that heavenly bodies have no accidents whatsoever perceptible to the sense and would make the science of astronomy impossible since all science begins in the sense. Cf. In II De Caelo lect. 14, n. 427(8). The text we are quoting goes on to say, "Et ideo pertingere possumus ad cognoscendum de superioribus corporibus et claritatem ipsorum secundum quam sunt nobis visibilia et quantitatem magnitudinis et motus ipsorum et figuram et etiam genus ipsorum secundum modum quo conveniunt in genere cum inferioribus corporibus," all things that are the foundation of astronomy.

ipsorum secundum rationem speciei scire non possumus nisi per negationem, inquantum transcendit inferiorum corporum naturam" (In De Caelo lect. 7, n. 180). This is why, St. Thomas adds, in the De Caelo Aristotle proves that heavenly bodies are neither heavy, nor light, nor generable, nor corruptible, all predicates that deny something found in bodies here below, but that tell us nothing positively of the proper nature of heavenly bodies according to their species.

In spite of our difficulty in knowing them in themselves, however, it was still considered possible to understand something about them, not only inasmuch as they were visible and had quantity and motion and belonged, to a certain extent, at least, to the same genus as earthly bodies, but also by reason of the relation between them and the latter. It is in this last respect that they were especially important for the theory of the universe. As circular motion is more perfect than and contains rectilinear motion, since the perfect contains the imperfect and stands as a term or an end in its regard, so also heavenly bodies were thought of as more perfect than and as containing the elements and all things composed from them.[1] Thus, as what is contained is on the side of matter, "habet rationem materiae," and what contains is on the side of form, "habet rationem formae,"

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[1]Cf. In I De Caelo lect. 4, nn. 41(9)f; In II De Caelo lect. 1, n. 468(11).

heavenly bodies were thought of as more formal and more 'honorable', and hence as more active.[1] They were seen as the universal active principle of changes in nature here below, while the elements were the universal matter of these changes. "Sicut caelum est universale activum eorum quae generantur, ita elementa sunt eorumdem universalis materia" (De Pot. q. 5, a. 7, c). Nature here below could move itself, but only under the influence of the heavenly bodies. "Natura inferior agens non agit nisi mota, eo quod huiusmodi corpora inferiora sunt alterantia alterata; caelum autem est alterans non alteratum" (De Pot. q. 3, a. 7, c). Thus heavenly bodies were principles of order here below while participating more intimately in the per se order of the universe.[2]

We have spoken of an order of place in the universe. We shall see how such an idea is bound up with the natural movements we have just been studying and which have given us the foundation for the Aristotelian model of the universe after we have looked at the argument against corporal infinity. Aristotle's argument against the existence of a corporeal infinite is, in fact, based on the supposition that such an idea is incompatible with the determination seen in bodies and the order that exists among them. 'Infinite body'

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[1] Cf. In II De Caelo lect. n. 485(7), n. 483(5); lect. 18, n. 468(11).

[2] Cf. De Spir. Creat. q. un., a. 8, c; supra, ch. 4, pp. 139-140.

entails a negation of order in the physical world, a negation of the order of places and of the order of natures. An infinite body would exclude all differentiation between bodies. An infinite number of bodies could not constitute a universe.

After establishing the existence and the nature of a fifth simple body, the "first body," as it is frequently referred to, the De Caelo goes on to take up the matter of infinity, first, according to size, secondly, according to number, and thirdly, according to duration, for infinity can be understood in these three senses. Actually, according to the Aristotelian order of science, the problem of infinity has already been dealt with, for, in the Physics, it has been shown that the infinite does not exist in act in the physical world, but only in potency.[1] But there it was shown with the supposition that there were only four simple bodies. Now that the existence of a fifth simple body has been shown, the matter has to be taken up again in more complete fashion, "ut universalior sit inquisitio veritatis" (In I De Caelo lect. 9, n. 95(2)). In a way, the argument of the Physics was situated on the ground of Aristotle's predecessors, none of whom had gone beyond the idea of the four simple bodies, or merely on a more abstract and dialectical level, and it had not dealt with the question conclusively. The idea of a

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[1]Cf. In III Phys. lectt. 8 and 9.

"first body" now makes it possible to do so, for it not only brings us the final element of the world's integrity but it also adds the term of completion and perfection required by this integrity.

The argument at first takes up each of the simple bodies in turn. First, it is argued at great length that a body whose natural movement is circular cannot be infinite in magnitude.[1] Then comes the argument that no body whose natural movement is rectilinear can be infinite, with reasons taken from the determinate places of the universe and from the nature of gravity and lightness.[2] We are given the picture of a universe bounded by the circumference of the heavenly bodies, where there are two extremes, determined by the rectilinear motion of the absolutely heavy (earth, simpliciter grave) and absolutely light (fire, simpliciter leve) bodies, the downward extreme which is the center, and the upward extreme which is the region nearest the circumference, with two intermediate simple bodies situated one relatively near the center (water, relative grave), and the other relatively near the upper extreme (air, relative leve).

But after arguing from the individual parts of the universe, "secundum proprias rationes singularium partium universi," the De Caelo then adopts a more general procedure, a

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[1] In I De Caelo lectt. 9-11.

[2] lect. 12.

more properly universal consideration, "per medium commune". St. Thomas explains that this is not merely a return to the dialectical arguments of the Physics, but a consideration of sensible bodies that exist actually. "In tertio enim Physicorum determinatur universaliter de infinito quomodo sit et quomodo non sit: ostensum est enim ibi quod infinitum est in potentia, sed non in actu. Nunc autem determinandum est alio modo de infinito, ostendendo scilicet universaliter quod nullum corpus sensibile potest esse infinitum in actu" (In I De Caelo lect. 13, n. 126(3)). The medium commune in this concrete consideration turns out to be what Aristotle calls his first hypotheses, "idest suppositiones prius factas, scilicet quod sint solae tres species motuum simplicium" (n. 130(7)). There cannot be an infinity of simple bodies, for there is only a limited number of simple motions and each simple motion is the proper motion of only one simple body. Nor can there be one body made up of only one kind of stuff that would be infinite, for this body would have to have one of the three natural motions, circular, down, or up, and hence would have to be like the heavenly bodies, or heavy, or light, all three of which have been shown to be necessarily finite (n. 135(12)).

Once it is admitted that this world in which we find ourselves is finite, the question arises whether there are a plurality of such worlds. After dealing with infinity

according to magnitude, the De Caelo sets out to show that there cannot be a plurality of worlds. The argument for this, at least as far as the strictly physical order is concerned, is based mainly on the nature of rectilinear movement. All bodies move and lie at rest both according to nature and according to violence, if their natural motion is rectilinear. This is not true of heavenly bodies in the Aristotelian system, for, with regard to them, there can be nothing violent nor outside of nature since they are incorruptibilia. On the other hand, wherever a body lies at rest according to its nature, that is the place to which it tends according to its nature; and if it lies at rest somewhere by violence, then it tends toward some other place by nature. The reason for this is that rest in some place is the end of any rectilinear natural motion and there is a correlation between rest and motion as there is between end and what is for this end. Finally, if there is some local motion which is violent for a particular body, then its opposite is natural for it. (lect. 16, n. 156(3)).

If there are two worlds, then, the earth in the other world will move to the center of our world by nature and so become a part of our world; or it would do so by violence only, which would be using the word 'earth' in an equivocal sense, since by nature earth moves to the center of this world. Inversely, and for the same reason, earth could not have its

natural place of rest in that other world, unless once again 'earth' were used in an equivocal sense, which was not what the proponents of such an idea meant to do (nn. 157(4)-160(7)). In fact, we can say in general, basing ourselves once again on the basic assumptions concerning natural movements, that, since the different species of movements are determined in kind and in number, in whatever world we may imagine, the movements will have to be the same and consequently the elements will also have to be the same, since the nature of the elements is proportionate to their motion. Thus, if there were two worlds, the earth in one, or the other, would be torn by opposite natural motions, for it would tend downward toward the center of its own world and also tend upward toward the center of the other world. Likewise, fire would tend upward in its own universe while at the same time tending downward with respect to the center of the other universe.

Distance here would make no difference as far as the nature of things are concerned (nn. 161(8)-163(10)). Nor could we escape the conclusion by saying that, while the elements may have the same nature, they would not be ordered to the same place numerically, but only to the same kind of place specifically, each in its own universe. Such an avenue is blocked by the fact that the nature of heavy and light bodies is determined according to certain places, "ad certa loca; ita scilicet quod omnia quae habent eandem

naturam, ad unum numero locum unam numero habent naturalem inclinationem" (lect. 17, n. 168(5)). This is shown by an analysis of change, which is always from one determinate thing to an opposite determinate thing.

In connection with the "first body" and its circular motion the argument for the unicity of the world becomes metaphysical for a moment. Unlike rectilinear motion, circular motion could not be said to be determined ad certum locum, and furthermore, the Physics had argued that the motion of the heavens was eternal. Hence, a strictly physical argument starting from circular motion was out of the question. The unicity of the world, however, is inferred by Aristotle from the unicity of the First Mover. But this argument could not but appear rather weak to St. Thomas, since, as we saw, for him God could have created other worlds besides this one. He calls attention to the possibility in commenting the De Caelo here from the viewpoint of final causality. "Nihil autem prohibet idem a pluribus desiderari; et ita videtur quod ex unitate primi moventis non possit ex necessitate concludi unitas caeli" (lect. 18, n. 180(6)). St. Thomas answers that no two worlds could be totally unrelated. There would have to be an order between them, which amounts to sending the question back to the realm of the physical order where the discussion began in the first place.

> Sed dicendum est quod multa possunt unum desiderare, non quidem quasi de pari, eo quod uni primo non immediate adiungitur absoluta multitudo; sed secundum quendam ordinem possunt multa desiderare unum, quaedam propinquius et quaedam remotius, quorum coordinatio in ordine ad unum ultimum, facit unitatem mundi. (Ibid.)

It will be noted here how much the idea of order depends on the idea of a first, or last, as the case may be, another indication of the reason why the "first body" played such an important role in the Aristotelian system of the physical world.[1]

We might think of the order or of the form of the universe as of other forms found in matter, which are singular through their union with this or that matter but which of themselves can be found in more than one individual. The

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[1] St. Thomas brings up the difficulty stemming from God's power to create other worlds in lect. 19, n. 197(14), and answers as follows, "Et ad hoc dicendum est quod, si Deus faceret alios mundos, aut faceret eos similes huic mundo, aut dissimiles. Si omnino similes, essent frustra: quod non competit sapientiae ipsius. Si autem dissimiles, nullus eorum comprehenderet in se omnem naturam corporis sensibilis: et ita nullus eorum esset perfectus, sed ex omnibus constitueretur unus mundus perfectus." The idea of other physical worlds, different from ours, only displaces the question of what the perfection of the universe would consist in, but would not invalidate the idea itself. This holds true even in the face of the modern idea of an anti-cosmos made up of anti-matter. As for the pointlessness of having a plurality of worlds exactly alike one another, this is something that would take us far beyond the purely cosmological point of view of the De Caelo. S.T. I, q. 47, a. 3 presents a good summation of St. Thomas's thinking in this matter, where the key to the question is found in a proper understanding of order: "ipse ordo in rebus sic a Deo creatis existens, unitatem mundi manifestat." Especially worth noting is the answer ad 2: "Nullum agens intendit pluralitatem materialem ut finem; quia materialis multitudo non habet certum terminum, sed de se tendit in infinitum; infinitum autem repugnat rationi finis."

universe is a sensible reality, "quoddam sensibile," and so we are justified in speaking of it as this universe. This, it would seem, leaves open the possibility of a plurality of worlds. In the Timaeus Plato had proved the unity of the world from the unity of the exemplar, St. Thomas points out; but here, from the very unity of any separate species, Aristotle concludes to a possibility of many worlds.[1] Aristotle himself excludes this possibility in another way, by appealing to the very peculiar relation which obtains between the form and the matter of this universe. *Illa quae habent formam in materia possunt esse multa numero unius speciei, non habet veritatem nisi in illis quae non constant ex tota sua materia" (lect. 19, n. 194(11)). The point is illustrated with one of Aristotle's favorite examples in matters such as these, simitas, a curve in a nose. Suppose all the flesh there is constituted one single giant nose, and that this nose were curved, there would be nothing left to be simum, nor could there be. And suppose that one man took up in himself all the flesh and bones there are, and in such a way that there would be no possibility of dissolution, there would be no possibility of other men existing besides this one man. This is the way it is in fact for the world.

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[1] lect. 19, n. 193(10). St. Thomas explains the difference by showing how unity can pertain to either exemplar or exemplatum in different ways.

* " Maior propositio secundi syllogismi, scilicet quod

> Et dicit verum esse caelum esse de numero singularium, et eorum quae ex materia constituuntur: non tamen est ex parte suae materiae, sed ex tota sua materia. Et ideo, quamvis sit alia ratio caeli et huius caeli, non tamen est aut potest esse aliud caelum, propter hoc quod tota materia caeli comprehensa est sub hoc caelo. (n. 196(13))

It is very important to note the concrete aspect of this argument. Just as the flesh of a nose is proper matter for simitas, and flesh and bones are proper matter for the human form, so also when we speak of this universe, even as a singular, we have to think of its matter as a whole, tota sua materia. Each of the three words is important.

To prove that the world is made from the whole of its matter, Aristotle returns to the basic tenets of his system and shows that no body, whether simple or compound, can lie beyond the circumference of this world by nature, which means that all sensible bodies lie within the totality of this world, or are parts of this world. The matter of the universe is, in fact, the natural sensible body, corpus naturale sensibile, which we see move either up, or down, or in a circle, or in any combination of these simple ways. The conclusion of the argument brings us back to the essential point for us in all this, the perfection of the universe.

> Concludit igitur quod neque sunt in praesenti plures caeli, neque fuerunt in praeterito, neque unquam poterunt fieri in futuro: sed istud caelum est unum et solum et perfectum, utpote constans ex omnibus suis partibus, sive ex tota sua materia. (lect. 20, n. 206(9))

It is generally known that Aristotle held for the eternity of the world. In Book VIII of the Physics it is argued that the circular motion of the heavens is eternal and in the rest of Book I De Caelo the discussion turns about the matter of generation and corruption as it applies to the universe as a whole. It is argued that the world as a whole is not, nor can it be, subject to either of these, and hence it is said to be infinite with respect to duration, without either beginning or end in time. It is also generally known that St. Thomas, according to his Christian faith, believed the world had begun in time. From this it is frequently supposed that, on this score, he simply rejected Aristotle, and that he simply substituted the notion of creation for the eternity of the world. Thus, for example, Munitz writes, "The second major change in the Aristotelian doctrine concerning the ungenerated and indestructible character of the universe was universally rejected during the Middle Ages as contrary to Judaeo-Christian theology, and the notion of a creation ex nihilo was put in its place."[1] But matters were far from being that simple. They could not be, for Aristotle's arguments for the eternity of the world were intimately bound up with his whole theory of the universe and it is quite evident that St. Thomas accepted the greater part of this theory. Indeed, in reading and

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[1]Milton K. Munitz, Space, Time and Creation, p. 19.

interpreting Genesis, he took pains to see what the Mosaic cosmogony meant in terms of this theory, not just as an exercise in ingenuity, but out of a concern to reconcile the two.[1]

In the first place, the arguments of Aristotle do not go against the idea of creation, for they tend to show that the world could not have come to be by generation, and creation is not a matter of generation. "Non enim dicimus quod incoeperit esse per generationem, sed per effluxum a primo principio, a quo perficitur totum esse omnium rerum, sicut etiam philosophi posuerunt" (In I De Caelo lect. 6, n. 64(7)). Or if we are going to use generation in a broader sense, we could say, "neque ponimus generationem corporum ex eo quod est in potentia, sed per creationem" (In III De Caelo lect. 8, n. 598(4)). Creation is a matter of the relation between the universe and the first, absolutely universal cause. It is quite compatible with the idea of an eternal cosmos. It all depends on the will of the first cause.

St. Thomas was well aware of how certain followers of Aristotle, conscious of the fact that the question of the eternity of the world ultimately had to be settled according to the manner in which it came from the divine will, set out

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[1]Cf. S.T. I, qq. 66-74, especially, q. 67, a. 4, c; q. 68, a. 3, c; q. 69, a. 2, ad 3; q. 70, a. 1, ad 3; also De Pot. q. 4, aa. 1 and 2.

to show that God had to will creation from all eternity.[1] This, according to a remark made in commenting the Liber De Causis, was the most potent argument (efficacior ratio) for the eternity of the world, and he gave special attention to refuting it.[2] But the arguments of the Physics and the De Caelo left the question of creation entirely open. "Non enim processit ex consideratione illa qua intelligitur exitus universi a Deo, sed ex illa consideratione qua ponitur aliquod agens incipere operari per motum; quod est particularis causae, et non universalis" (De Pot. q. 3, a. 17, c: C).[3] Such arguments do not prove that 'incorruptible' things have no beginning whatsoever, but only that they have no beginning within the natural process as such. "Non concludit simpliciter quod incorruptibilia non incoeperunt esse, sed quod non incoeperunt esse per modum naturalem, quo generabilia et corruptibilia incipiunt esse" (S.T. I, q. 46, a. 1, ad 2).

Part of Aristotle's argument in the De Caelo consists in showing, (against Plato, who held the world to

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[1] De Pot. q. 3, a. 17, c: D.

[2] In De Causis lect. 11.

[3] Note the significance of the distinction between universal and particular cause here. See also In VIII Phys. lect. 2, nn. 987(17)ff, where the same distinction is used in conjunction with another fundamental distinction in this matter, that between transmutation or motus in the production of something and creation, which is without transmutation of anything and absque motu. Cf. also De Subst. Sep. c. 9.

be incorruptible though generated,) that what is incorruptible is also ingenerable, for generation and corruption always go together. It should also be kept in mind that among the naturalists before Aristotle, and with Aristotle himself, it was generally admitted as an axiom that nature could produce nothing ex nihilo. No one who rightly understands the notion of creation would feel bound to contest this axiom. St. Thomas certainly did not.

Furthermore, it does remain that there was an opposition between what VIII Phys. and I De Caelo argued to and faith in creation in time. "A quibus tamen in hoc differimus, quod illi ponunt Deum produxisse caelum coaeternum sibi; nos autem ponimus caelum esse productum a Deo secundum totam sui substantiam ab aliquo determinato principio temporis" (In I De Caelo lect. 6, n. 64(7)). But St. Thomas explains that the arguments in these places, taken from the philosophy of nature, are only dialectical, and not strictly demonstrative, "apparent quasi rationes disputantis contra positionem" (De Pot. q. 3, a. 17, c: C). When the question of eternal movement comes up, Aristotle cites the positions of Empedocles, Anaxagoras, and even Plato, all of whom maintained that the world was somehow generated, and then proceeds to argue against them, showing the impossibility of these positions, and nothing more. "Nec rationes quas ad hoc Aristoteles inducit, sunt demonstrativae simpliciter, sed secundum quid,

scilicet ad contradicendum rationibus antiquorum, ponentium mundum incipere secundum quosdam modos in veritate impossibiles" (S.T. I, q. 46, a. 1, c). St. Thomas even cites a text of Aristotle himself from the Topics where, as an example of a dialectical problem, the Philosopher mentions the question whether the world is eternal or not (Ibid.).

In this way St. Thomas manages to sever any supposed necessary connection between affirming the eternity of the world and the rest of Aristotle's system of the physical world. In doing so he did no violence to the system for, as Solmsen remarks, "Aristotle does not regard time as integral to his cosmology" (p. 318). While he insisted on finiteness and perfection with regard to magnitude and number, he did not with regard to time. St. Thomas could thus, even though for reasons of Faith, and not for reasons of nature, since in this respect he considered the question quite open, introduce a determination in the dimension of time without ceasing to be an Aristotelian, as some Aristotelians of his time thought.

We shall see later on how he thought, also for reasons of Faith, that the motion of the heavens would one day come to a halt, while the bodies themselves would continue to subsist eternally. But then we shall also see that he considered this position not only a matter of faith, but something more

reasonable in itself than that of Aristotle.[1] Can we infer from this a beginning of the world as also being more reasonable in itself? Perhaps, but the matter is not so simple, for heavenly bodies in the final state of the universe, in St. Thomas's view, though no longer moving, will remain incorruptible, as will the world as a whole, and Aristotle's argument goes from incorruptibility, and not from immobility, to ingenerability. The reasons St. Thomas gives for saying that the eventual cessation of heavenly movements seems more reasonable might possibly be adapted to show a greater reasonableness in favor of a beginning in time for the universe as well, but we know of no place where St. Thomas did so. His remarks in this direction usually are limited to pointing out a certain usefulness in the fact that the world began in time, after not having been (postquam prius non fuerat), that is, it serves to make more manifest the total dependence of the universe on the freedom of the Creator, "ut manifestetur excellentia virtutis eius supra totum ens; quod scilicet totum ens tantum dependet ab ipso, et eius virtus non est alligata vel determinata ad productionem talis entis" (In I De Caelo lect. 29, n. 287). But such dependence would be no less real, even if the world were created from all eternity, though it would perhaps not be as manifest to men.

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[1] Cf. De Pot. q. 5, a. 5, c. The appearance of man on the scene will make the big difference.

The explanation of ingenerability and incorruptibility in a corporeal thing lay in the idea of its being composed of all the matter proper to its species, ex tota sua materia, which in turn implied a higher degree of perfection for the form, quae complet totam possibilitatem materiae.[1] Matter itself cannot be generated, but things are generated from it. It is the substratum of change, but it has no substratum itself. Matter makes change possible when it contains the possibility of being many different things. A thing is generated from something that was somehow its contrary but whose matter contained possibilities for forms other than the one it had, or at least for the form it receives through generation. The thing generated is corruptible because its matter remains in potency to other forms, somehow contrary to the form it has acquired by generation. This does not mean that, when it is corrupted, it will necessarily return to what it was before generation, but simply that corruption is to another form, something different, the destruction of something and the generation of something else. But if a form is so perfect that its exhausts or fulfils all the possibility of its matter, then the thing so constituted is no longer corruptible, since it contains no contrariety within itself; nor is it generable, since nature cannot produce anything except

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[1]Cf. De Subst. Sep. c. 8.

from contraries.[1] Nature produces many individuals of the same species in order to preserve the species, but if an individual is incorruptible that purpose is served by the individual alone. There remains no potentiality to other forms in its matter, because such an individual realizes in itself all the perfection of the species. As we know, the heavenly bodies for a long time were thought to be just such perfect individual material beings; each of them was thought to be incorruptible, and hence to constitute a species unto itself.[2] The reason for this, in the mind of Aristotle, as we saw, was based on the circularity of what was thought to be the proper natural motion of these bodies and the perfection of circularity as involving no contrariety.

The argument for the incorruptibility of the world, however, brought something more into play than merely this notion of circularity. To be sure, the idea that circularity was the most perfect figure and that the heavenly bodies were circular in nature had a good deal to do in the construction of Aristotle's model of the world. But the argument appealed more to the idea of completeness than anything else, and this argument remains valid no matter what the model. Outside of this physical world there is nothing physical from which it

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[1] Implicit in this is that such things, if they come to be, they come to be only by creation. What we say here about generation goes back to Aristotle's first analysis of generation in Book I of the Physics. Cf. supra, ch. 3, pp.93-95.

[2] Cf. supra, pp. 139-140.

could have been generated and into which it could be corrupted. This physical world comprises all the matter there is: *non habet contrarium ex quo generetur* (*S.T.* I, q. 46, a. 1, ad 3). This may sound like a mere repetition of what we saw at the beginning of the *De Caelo*, where perfection of the universe was defined independently of any model. But the study of the natural bodies themselves has brought the idea of order into play and this makes an important difference, for the idea of perfection is thereby determined more explicitly as it applies to the universe.

The *Timaeus* had maintained that the world was generated from chaotic matter. This could be understood loosely as meaning that this world evolved from a state of chaos to its present state of order. This is perhaps all that Plato had in mind, but Aristotle saw more to it than that. According to a strict understanding of generation, this world did not exist before it was generated; what existed before was another world, if anything. There was matter, supposedly, but there was no world yet: "mundus nondum erat." How then characterize matter existing "before the world"? If we say it was ordered, then we imply there was another world. If we say it was disordered, as Plato did, then the question arises: was it disordered by violence or by nature? Aristotle argues against both positions, but his argument against the second is what interests us here. According to him,

Plato did in fact say that the disorder was according to nature, and this was to affirm two contraries at the same time. "Ponitur enim quod mundus nondum erat: si vero elementa movebantur secundum naturam, necesse est quod tunc mundus erat, si quis attente velit considerare" (In III De Caelo lect. 6, n. 581(2)).

Like Aristotle, Plato admitted the existence of the four elements, and that these elements had their natural motion. The motion of the elements in the pre-cosmic state, however, was supposed to be without order, "motu inordianto... materia inordinate fluctuabat..." This was a way of saying that the world was not yet. But to say that the elements moved according to nature is to say that they moved then as they move now, heavy bodies moving toward the center and finding their rest there and light bodies upward and finding their rest above, and hence that the world was then as it is now. "Haec est dispositio mundi existentis: sequitur ergo quod mundus esset antequam fieret" (Ibid.). Our understanding of the order of the universe began precisely from the natural movements of the simple bodies.

A look at the relation between nature and order will bring out the contradiction more clearly.

> Nihil enim aliud est esse aliquid inordinate, quam esse praeter naturam. In rebus enim sensibilibus apparet quod ordo est propria natura eorum: quia scilicet per propriam naturam unumquodque eorum inclinatur ad aliquid certum; haec autem inclinatio est ordo qui

> attenditur in sensibilibus rebus; tunc enim unumquodque dicitur inordinate agere aut moveri, quando hoc accidit non secundum inclinationem naturae propriae. (n. 584(5))

Nature is not an absolute rule, but it does incline sensible things in certain ways, what happens always or almost always, "semper vel ut frequentius". Order in sensible things is seen in function precisely of this inclination of nature. Order for them is their proper nature. Thus, to speak of things moving according to nature and at the same time in disorder is to contradict oneself, or at best to equivocate on the meaning of nature and of order. We might try to imagine a different kind of nature, but then we would have to think of a different kind of order, not of disorder simply. Disorder is always relative to an order.

Aristotle's position, as taken against the Timaeus, does not entirely preclude all evolution from the universe. Order as he conceived it was not static, especially not the order of nature. Since movements are specified by their term, the cosmic places did determine the natural inclinations of the elements, but this did not mean that they all had to be in their respective proper places. Life in such a universe would be impossible because, if each element were in its proper place, there could be no compound bodies. Such a universe would also be motionless, at least apart from the heavenly bodies, because the inclination of a natural

body is to rest when it is in its proper place, and not to move. Aristotle would have been the last to deny the reality of these in his universe.

The distinction to keep in mind here is the one made by St. Thomas in answer to a difficulty concerning the difference between things whose motion is circular and those whose motion is rectilinear. The first are said to be incorruptible and complete according to their species, but the second are not:

> corporibus autem aliis generabilibus et corruptibilibus debetur motus extra proprium locum, qui est absque complemento speciei. Non tamen ita quod corpus quod movetur naturaliter motu recto, non habeat primum complementum suae speciei, quod est forma; hanc enim sequitur talis motus: sed quia non habet ultimum complementum, quod est in consecutione finis, qui est locus conveniens et conservans. (In I De Caelo lect. 4, n. 37(5))

Thus, the things here below have in themselves, by their form, a principle of order which is an inclination to movement. This is a principle of completion and perfection, but only of first perfection; the ultimate completion would come with the attainment of the end toward which the inclination is tending. But before that happens other kinds of principle intervene in the universal movement, principles of life, and principles of reason, and another kind of finality or ultimate perfection comes to the fore.

Hence, though the world as a whole is above generation and corruption, some parts of it are subject to generation and

corruption as parts, but not as constituting a totality, "generabiles et corruptibiles secundum partes, licet non secundum totum, sicut patet de elementis" (In II De Caelo lect. 1, n. 289(2)). Other things, however, which are not properly parts, though they come from the parts of the world, are subject to generation both as parts and as totality, "sicut animalia et plantae et lapides, non proprie sunt partes mundi (alioquin mundus nunquam perfectus esset, cum non habeat omnia huiusmodi simul): sed huiusmodi sunt quidam effectus partium mundi; et ideo, licet huiusmodi res subjaceant generationi et corruptioni non solum secundum partem, sed secundum totum, nihilhominus tamen totus mundus caret generatione et corruptione" (Ibid.). There was room for fluctuation and disorder in the Aristotelian universe, but it had to be understood in terms of order. Both were given and Aristotle tried to cope with both much in the way that Whitehead suggested when he wrote: "now the correlative of 'order' is 'disorder'. There can be no peculiar meaning in the notion of 'order' unless this contrast holds. Apart from it, 'order' must be a synonym for 'givenness'. But 'order' means more than 'givenness', though it presupposes 'givenness', 'disorder' is also 'given'. Each actual entity requires a totality of 'givenness', and each totality of 'givenness' attaints its measure of 'order'."[1] The Timaeus had attempted the impossible in

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[1] Process and Reality, Part II, c. 3, "The Order of Nature," p. 127.

trying to think an utterly disordered totality.

What made a radical evolution of the world as a whole impossible in the Aristotelian system, however, was the ingenerability and incorruptibility of the heavenly substances. These were considered to constitute the greatest part of the world, "maxima pars corporum mundi," and while they were seen as actively influential in the changes that take place here below, in themselves they were thought to be invarying and invariable in their being and in their movements. If we add to this that their motion was from all eternity and for all eternity, we can think of nothing else but a cyclic fluctuation in the order of the universe, the various moments of which can be ordered according to a duration stretching from an instant-now taken at any point in the duration, either back into the past ad infinitum or forward into the future also ad infinitum.

> Patet autem quod in hoc utimur ipso nunc, ut principio et primo in tempore; quia per propinquitatem vel remotionem respectu eius, dicimus aliquid esse prius vel posterius. Non enim potest accipi hac positione facta, aliquod principium in tempore, nisi ab aliquo nunc, quod est medium praeteriti et futuri, ut ex utraque parte tempus in infinitum procedat.
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> (In V Metaph. lect. 13, n. 941)

By dissociating the infinity of time from the rest of Aristotelian cosmology, as he did, and by positing a beginning in time, as his Faith and his theology led him to, St. Thomas was introducing a different concept of time into the system,

a linear idea of duration, where the instant-now was not the only available principle of order in time. The novelty of this is something St. Thomas was quite aware of.

> Quod ergo dicit, quod quandocumque est tempus, necesse est ponere aliquod nunc esse, indubitanter concedendum est: omne autem nunc est principium et finem temporis, concedi non oportet, nisi ponatur etiam motum semper esse. ... Si ergo ponimus motum non semper fuisse, sed est accipere aliquod primum indivisibile in motu, ante quod nihil fuit motus, erit etiam accipere aliquod nunc in tempore, ante quod non fuit aliquod tempus.
> (In VIII Phys. lect. 2, n. 990(20))

With this understanding of time, however, where there is a beginning and an end different from the beginning, where there is a direction in the changes and the fluctuations that take place in the universe as a whole, St. Thomas continued to accept the incorruptibility, and consequently the ingenerability, of the heavenly bodies, for he had no definite grounds to call this into doubt and it seemed to explain so many things. Thus he was led to infer that God created the order of the heavens immediately and instantaneously as a part of the first perfection of the universe. Hence he too, along with Aristotle, did not think the physical world as a whole had evolved.

Apart from this conception of the heavenly bodies, however, there was nothing in the Aristotelian understanding of order to make an evolution of the world as a whole impossible. Against the Timaeus, the De Caelo had argued that, as what is according to nature is prior to what is by violence,

so also order is prior to disorder.[1] But this did not make it inconceivable for the universe to begin in a relative state of disorder and develop toward greater order. This sort of thing was seen happening in nature constantly in the generation and growth of animals, truly complex totalities made up of parts ordered among themselves. And besides, there was a clear distinction between two kinds of order in nature to account for it.

> Duplex est ordo naturae. Unus secundum viam generationis et temporis: secundum quam viam ea quae sunt imperfecta et in potentia, sunt priora. ... Alius est ordo perfectionis, sive intentionis naturae; sicut actus simpliciter est prius secundum naturam quam potentia, et perfectum prius quam imperfectum.
> (S.T. I, q. 85, a. 3, ad 1)

Thus, in living things what is first according to nature comes last in the order of time. Could not the same supposition have been made concerning the universe as a whole? That was not as easy as it might seem, for between the generation of an individual animal and the supposed generation of the world there is a notable difference. The principle of generation for an animal is another animal of the same species, one, be it carefully noted, that has already reached a certain completion, so that in this case what is perfect is prior in time at least in the order of nature, though not within the same individual. In the case of the universe as a whole, however,

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[1] Cf. In III De Caelo lect. 1, n. 581(2).

this seems to have no parallel. It would imply the order of nature actually existing before the order of nature, the world existing before it came to be, the sort of thing the De Caelo has shown to be contradictory. It would also imply generation of the world as a whole from a contrary non-world, which is also contradictory.

The fact of creation by an intelligent Maker offers a way out of the difficulty, because then, what is perfect and ordered can still be first in intention at least, though last in realization. The order implanted in the potentiality of nature would be there only imperfectly at the beginning and would gradually emerge toward perfection. It is with such an idea in mind that St. Thomas could approve of at least a partial evolution in the manner of creation, such as he found in St. Basil and other Fathers influenced by Plato.[1] In fact, he saw in such an evolution a way of making more manifest, in creation itself, the wisdom "cuius ordo requirit quod aliquid ex imperfecto ad perfectum ducatur" (De Pot. q. 3, a. 6, ad 16). But in the perfection and the order of the heavens St. Thomas saw another manifestation of the divine wisdom, and possibly an even greater one. "Opera manuum tuarum sunt caeli; et hoc patet quia diversitas in istis inferioribus potest reduci ad dispositionem materiae; sed

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[1] Cf. De Pot. q. 4, a. 2; S.T. I, q. 66, a. 1, c; q. 74, a. 2, c.

diversitas corporum caelestium nullo modo potest reduci nisi ad sapientiam divinam" (Supra Ad Haebraeos c. 1, lect. 5, n. 70b). The wisdom of God thus appeared differently in the order of the heavens and in the order of generation here below. While the dispositions of matter and their order might enter into the explanation of diversity here below, in the heavens they did not. By reason of their ingenerability and incorruptibility the diversity and order among them was attributable directly only to God.

The order of the heavens, however, is not without connection with the order of generation in the cosmological system of Aristotle and St. Thomas. We have seen that the heavens were supposed to have some influence on the movements of inferior bodies. There was a diversity in the heavenly bodies to be explained and this is where the relation between the inferior and the superior bodies came in. Given the perfection of the heavenly bodies in the system, we should expect them to be perfectly one and perfectly regular. But this was obviously not the fact, according to the sensible evidence that was to be so highly respected. We cannot go into the astronomical aspects of the question here, nor into the astronomical theory used to account for the appearances.[1]

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[1] A good presentation of these will be found in J.L.E. Dreyer, A History of Astronomy from Thales to Kepler, c. 4, "The Homocentric Spheres of Eudoxus," pp. 87-107; c. 9, "The Ptolemaic System," pp. 191-206. Between the time of Aristotle

What we are concerned with is the difficulty that arises from such theories within the cosmological framework we are studying. How are such irregularities in the heavens compatible with their incorruptibility and their perfection? Such a difficulty could not be dealt with from the purely natural viewpoint we have maintained to this point, that is, the viewpoint of movement ad situm alone.

> Quaestio difficilis videtur, quia nos inquirimus de corporibus caelestibus ac si essent sola corpora habentia quendam ordinem, absque hoc quod sint animata; et sic videtur nobis quod debeat in eis esse ordo motuum secundum ordinem numerorum, et secundum situm corporum. Sed ad hoc quod praedicta dubitatio solvatur, oportet opinionem habere de eis quod participent non solum vitam quamcumque, sed etiam actionem; quod est proprium habentium animam rationalem, quae agunt propter finem, tanquam habentia dominium sui actus, et non agunt ex solo naturae impetu, sicut omnia irrationalia.
> (In II De Caelo lect. 18, n. 458(1))

Only a higher degree of order in the universe could embrace

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and that of St. Thomas astronomy had departed from the homocentric spheres theory of Eudoxus, and the Ptolemaic system of excentrics and epicycles was generally adopted. While this affected many details of the Aristotelian system, it did not call for a revision of the whole. In the Ptolemaic system the earth was still the center of the universe and the heavens still moved about it. "In his general conceptions," Dreyer writes, "Ptolemy did not differ from his predecessors in any way" (p. 192). The differences came in the manner of explaining the irregularities seen in the heavenly motions and of ordering the planets. St. Thomas was aware of the differences to a certain extent, but he did not fail to see the sameness. "Nihilhominus omnia corpora caelestia moventur circa centrum mundi secundum motum diurnum, qui est motus supremae sphaerae revolventis totum caelum" (In I De Caelo lect. 3, n. 28). For the differences inasmuch as they affected the texts of Aristotle, cf. especially In II De Caelo lect. 17; In XII Metaph. lect. 10. It is in these contexts that St. Thomas expressed some of his most interesting ideas concerning the revisability of theories devised to 'save appearances'.

both the order of place and the indetermination left within that order by reason of the irregularity in the heavenly bodies. Quite clearly, St. Thomas's reason for speaking of reason and action in view of an end in the preceding text is to call to mind such a higher order. If the end of the intelligence that directs the heavenly motions is something other than merely attaining the place proper to each of the constitutive parts of the universe, then it will not be without reason or order if the motions do not follow simply an order of place. "Hoc autem supposito, nihil videtur praeter rationem accidere, si multitudo motuum non procedat secundum corporum situm: quia magis est accipienda diversitas motuum et multitudo eorum secundum habitudinem ad bonum finale, quod est principium in omnibus agibilibus" (Ibid.).

The introduction of an intelligent mover at this juncture is not arbitrary, as St. Thomas is careful to show in C.G. III, c. 23, De Pot. q. 5, a. 5, c, and in Comp. Theol. c. 171. This is something required by the very nature of the heavenly bodies, as it was understood in the Aristotelian system, for the movement of the heavens was not natural in the same way that the movement of the elements was natural. The movement of an element has within the element, the mobile, its principle which is not only material and receptive, but also formal and active. The movement of the element flows from its form. But it is impossible to say as much for the

heavenly body, because nature always tends to one determinate thing while the nature of a heavenly body as such does not. By their natural movement the elements tend toward their proper cosmic place, where it is better for them to be and where they lie at rest. But that cannot be said for the natural movement of the heavens, because the heavenly body has no place of rest. Any place to which it comes is for it both principle and end. Nature brings it to this place and makes it depart from it as well. "Unde non potest esse suus motus naturalis quasi sequens aliquam inclinationem naturalis virtutis inhaerentis, sicut sursum ferri est motus naturalis ignis" (De Pot. q. 5, a. 5, c).

Nor can we say that nature simply inclines the heavenly body to move, for that is repugnant to nature. "Manifestum est enim quod natura semper intendit ad unum: unde illud quod ex sui ratione unitati repugnat, non potest esse finis ultimus naturae. Motus autem unitati repugnat, inquantum id quod movetur, alio et alio modo se habet dum movetur. Natura igitur non producit motum propter se ipsum, sed causat motum intendens terminum motus, sicut natura levis intendit locum sursum in ascensu, et sic de aliis" (Comp. Theol. c. 171, n. 338).

Thus we have to say that the active principle of the heavenly motions is outside the heavens themselves, which does not prevent us from calling it natural nevertheless, for

the heavenly body remains apt for such a movement. Such a movement remains according to its nature.

> Dicitur autem motus circularis esse naturalis caelo, in quantum in sua natura habet aptitudinem ad talem motum; et sic in seipso habet principium talis motus passivum; activum autem principium motus est aliqua substantia separata, ut Deus vel intelligentia vel anima, ut quidam ponunt; quantum enim ad praesentem quaestionem nihil differt. (De Pot. q. 5, a. 5, c)

The introduction of a principle that transcends nature does not, however, make anything possible or plausible in nature. This superior principle is an intelligence, a principle of order. For Aristotle and for St. Thomas this order appeared in nature itself, in a certain correspondence between the irregularities of the heavens and the irregularities in the order of generation and corruption. There was a rhythm of generation and corruption here below which seemed to correspond to certain changes in the position of the heavenly bodies. There was also a constancy and a permanence in this rhythm which seemed to depend no less on the heavenly motions, but in this regard, on their regularity.

What bound all these things together in the Aristotelain system can be seen in a long argument showing the necessity for a plurality of motions in the heavens.

> Si caelum est quoddam corpus divinum, necesse est motum eius esse sempiternum et circularem; si motus est sempiternus et circularis, necesse est terram esse; si terra est, necesse est ignem esse; si ignis est et terra, est necesse etiam aliqua corpora intermedia esse; si autem sunt huiusmodi corpora, necesse est generationem esse; si autem generatio est, necesse est plures motus esse in caelo. (In II De Caelo lect. 4, n. 333(4))

If there is a circular body, it must have a center, the earth. Opposite the earth, which is simply heavy, there has to be a body that is simply light, fire. If two such extremes exist, there have to be intermediates, water and air.[1] Each one of these elements is stable in itself; it is not composed of contraries as are the compounds, which have within themselves an active principle of corruption. But each one is composed of a matter that can have another form, and so it has within itself a passive principle of corruption.[2] Under the active influence of the heavenly bodies, and through the qualities of these four elements, there takes place between the latter a process of mutual transmutation, generation and corruption.

Now one motion alone in the heavenly bodies could not account for what this involves, "diversam dispositionem in corporibus inferioribus," since its effect could be only uniform, and not generation at one time and corruption at another. "Unde necesse est esse alium motum, qui est obliquum circulum, qui proprie causet generationem et corruptionem per elongationem et appropinquationem planetarum ad nos, sicut primus motus causat permanentiam et sempiternitatem in rebus" (n. 341(12)). The order of cosmic places thus appears somehow subordinate to the order of generation in the universe, or at least to the end sought in the order of generation. It is incomplete in itself and so it brings us to consider the order of generation itself.

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[1] Cf. De Pot. q. 5, a. 7, c.

[2] Cf. Ibid.; and q. 5, a. 9, c.