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The *Prooemium* to the *Physics* of Aristotle

FOREWORD

In order that man may proceed correctly in a science, it is necessary that he understand the mode of procedure proper to that science. However, since it is difficult to attend to two things at the same time, man should be instructed in the mode of a science before he proceeds in the investigation of the science itself. Besides the mode proper to the individual sciences there is the mode common to all sciences. Man should be instructed in both of them before he enters on the particular sciences. It is logic which teaches the common mode. Each science should treat its proper mode in the beginning.

Dicit ergo primo, quod quia diversi secundum diversos modos veritatem inquirunt ; ideo oportet quod homo instruatur per quem modum in singulis scientiis sint recipienda ea quae dicuntur. Et quia non est facile quod homo simul duo capiat, sed dum ad duo attendit, neutrum capere potest ; absurdum est, quod homo simul quaerat scientiam et modum qui convenit scientiae. Et propter hoc debet prius addiscere logicam quam alias scientias, quia logica tradit communem modum procedendi in omnibus aliis scientiis. Modus autem proprius singularum scientiarum, in scientiis singulis circa principium tradi debet.[1]

It shall be the purpose of this article to make certain considerations on the proper mode of natural science which will add some knowledge to the modern discussion on the meaning of the philosophy of nature.

One of the most fundamental problems with which scholastic philosophy has been confronted due to the rise of experimental science, is the problem of what we shall call the ' starting point of the philosophy of nature.' Modern scientific knowledge has succeeded admirably in helping man control and effectively use nature. This knowledge from its beginning is rather detailed and is expressed in precise mathematical formulas. The philosophy of nature, however, which cannot boast of this tremendous success in the practical order has been traditionally founded on a general and what we shall call here without defining for the moment, a confused knowledge. It defines in terms of general principles rather than mathematical formulas and proffers as evidence common experience rather than closed experiment.

The twentieth century man raised in the climate of opinion of detail and mathematization will have one of two reactions to this philosophy of nature. Either he will respect it and gently raise it

1. S. Thomas, *In II Metaphysicorum*, lect.5 (edit. Marietti), n.335.

to the level of metaphysics and thus be rid of it or he will accept it as a generally natural science but demand that it wait on the findings of modern science before it dare enunciate its theories. In this second case, the philosophy of nature will adopt as its ' starting point ' not a general and confused knowledge but the detailed and precise knowledge of modern science. It will then be free to proceed to its own proper philosophical reflection.

The order followed by Aristotle and St. Thomas in their study of nature is quite different. For them, the ' starting point ' is a general and confused knowledge which by a process of concretion approaches the particular and the distinct. The purpose of this paper shall be to explain their position.

It was mentioned that it would be the purpose of this article to make some considerations on the mode proper to the philosophy of nature. Here we have made that purpose more precise by saying that we would determine the starting point of the philosophy of nature and the procedure to be followed. In what way does the determination of the starting point and of the procedure belong to the study of the mode ?

It is in Chapter Three of the Second Book of the *Metaphysics* that Aristotle discusses the mode proper to the consideration of truth. In the first part of this chapter, he discusses the different ways in which men consider truth. This he does by showing the importance of custom in the attainment of truth and by indicating the various ways in which men accept truth. There are some men who by custom will accept nothing which is not proved with mathematical accuracy. Others always demand sensible examples. Still others will be convinced only by the authority of great poets.

> The effect which lectures produce on a hearer depends on his habits ; for we demand the language we are accustomed to, and that which is different from this seems not in keeping but somewhat unintelligible and foreign because of its unwontedness. For it is the customary that is intelligible. The force of habit is shown by the laws, in which the legendary and childish elements prevail over our knowledge about them owing to habit. Thus some people do not listen to a speaker unless he speaks mathematically, others unless he gives instances, while others expect him to cite a poet as witness. And some want to have everything done accurately, while others are annoyed by accuracy, either because they cannot follow the connexion of thought or because they regard it as pettifoggery. For accuracy has something of this character, so that as in trade so in argument some people think it mean.[1]

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1. ARISTOTLE, *Metaphysics*, II, chap.3, 994 b 31 – 995 a 11. In this article we shall cite ARISTOTLE in the English translation edited by RICHARD MCKEON, Random House, New York (1941). At times we shall add the Latin translation of WILLIAM OF MOERBEKE on which ST. THOMAS based his commentary. We shall do this when we think it necessary for understanding either ST. THOMAS or ARISTOTLE. ST. THOMAS will always be cited in Latin.

In the second part of the chapter, Aristotle shows that the mode which is proper to the consideration of the truth, depends on the subject of inquiry. Before one studies a science one must be acquainted with the mode proper to the science. Each science differs. We are not to expect mathematical accuracy in all sciences. The subject of the philosophy of nature is immersed in matter and consequently certitude is often lacking. Thus it is, that before we study each science, we must study its mode. It is difficult enough to understand the mode and the science but the two studies should not go together. Thus it is, that before we study the science of nature, we must determine the meaning of nature and the causes by which this science demonstrates.

Hence one must be already trained to know how to take each sort of argument, since it is absurd to seek at the same time knowledge and the way of attaining knowledge ; and it is not easy to get even one of the two.

The minute accuracy of mathematics is not to be demanded in all cases, but only in the case of things which have no matter. Hence its method is not that of natural science ; for presumably the whole of nature has matter. Hence we must first inquire what nature is : for thus we shall also see what natural science treats of and whether it belongs to one science or to more to investigate the causes and the principles of things.[1]

In his commentary on this passage, St. Thomas points out two things which are not explicitly mentioned in the text. First of all, he mentions that before we study a science we must not only have studied the mode proper to the science but also the mode common to all science, namely logic.[2] Secondly, he points out that it is in the Second Book of *Physics* that Aristotle determines the mode proper to Natural Science.

Et, quia in scientia naturali non convenit iste certissimus rationis modus, ideo in scientia naturali ad cognoscendum modum convenientem illi scientiae, primo perscrutandum est quid sit natura : sic enim manifestum erit de quibus sit scientia naturalis. Et iterum considerandum est, " si unius scientiae ", scilicet naturalis, sit omnes causas et principia considerare, aut sit diversarum scientiarum. Sic enim poterit scire quis modus demonstrandi conveniat naturali. Et hunc modum ipse observat in secundo Physicorum, ut patet diligenter intuenti.[3]

From what has been said, it seems evident that the word ' mode ' as used in the context of Chapter Three of Book Two of the *Metaphysics* refers to the certitude and type of argument which one will use in each science. In this sense, it would seem that the mode proper to

1. ARISTOTLE, *Metaphysics*, II, chap. 3, 995 a 11 – 995 a 20.

2. S. THOMAS, *In II Metaph.*, lect.5, n.335. In this article in citing S. THOMAS's commentary on the *Metaphysics*, we shall always use the Marietti edition.

3. ST. THOMAS, *In II Metaph.*, lect.5, n.335.

natural science is sufficiently indicated in the Second Book of the *Physics*. There is, however, a more common sense of the word according to which the mode of natural science is also indicated in the First Book of the *Physics*. In this more general sense the word ' mode ' would apply not only to the certitude and type of argument but also to the order of procedure. Before studying nature it is not only necessary to define nature but it is also necessary to know the order in which we should study the subjects of the science.[1] Since the notion of order implies that which is prior and that which is posterior,[2] it follows that there can be no consideration of the order of a science without investigation of its principles or starting point.[3] Thus in so far as the study of the mode of a science involves determination of its order, it should include an investigation of its principles or starting point.

It is in the *Prooemium* or first chapter of the *Physics* that Aristotle outlines the order to be followed in the science of nature. The details appear more distinctly in the succeeding treatises but it is in this first *Prooemium* that the general foundations are laid. It will be by means of a rather detailed commentary on this *Prooemium* that we shall attempt here to determine the starting point of natural science.[4]

As in many of the other Aristotelian *prooemia*, this introduction to the *Physics* is extremely brief and succinct. The very brevity and simplicity of expression indicates a latent perfection of thought which may well be expanded by commentary. Thus St. Thomas comments on this and each of the other *prooemia* in great detail. It may be asked why Aristotle expresses himself so briefly at this point. Perhaps, the answer is found in the fact that as he begins a science the master assumes a certain amount of docility and natural faith in his disciples. Here, he does not descend to detailed argument but relying on this natural faith proceeds in an orderly fashion in his science. The truth of what is said here will appear more easily after the student has been initiated into the science. The master is proceeding *prooemialiter*.

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1. The study of nature should be preceded by a study of the common mode of human knowledge, logic ; by a study of the order of procedure and finally by a study of the proper mode as proposed in Book Two of the *Physics*. Here we are interested in the second. For pertinent studies of the first and third cf., MELVIN GLUTZ, C.P., *The Manner of Demonstrating in Natural Philosophy*, River Forest, 1955, pp. 1-65. and THOMAS MCGOVERN, S.J., " The Division of Logic " in *Laval théologique et philosophique*, Vol. XI, 1955, n.2 and Vol. XII, 1956, n.1.

2. " Respondeo dicendum, quod ordo in ratione sua includit tria, scilicet rationem prioris et posterius . . . " ST. THOMAS, *In I Sententiarum*, dist. XX, Q. I, a.3, quaestiuncula 2.

3. " The words ' prior ' and ' posterior ' are applied (1) to some things (on the assumption that there is a first, i.e. a beginning, in each class) because they are nearer some beginning . . . " ARISTOTLE, *Metaphysics*, V, chap.11, 1018 b 8.

4. In this article we shall use the expressions ' philosophy of nature ' and ' natural science ' interchangeably as does ST. THOMAS.

The purpose of the *Prooemium* is to manifest the order of procedure in natural science. This is done in two steps. First of all, Aristotle shows that we must begin with a consideration of principles. Secondly, he shows that we must begin the study of nature with an investigation of the more universal principles. We shall study each step in detail.

We present here in parallel columns the Latin translation by William of Moerbeke of the *Prooemium* to the *Physics* and the English translation of Hardie and Gaye.

Quoniam quidem intelligere et scire contingit circa omnes scientias, quarum sunt principia aut causae aut elementa, ex horum cognitione (tunc enim cognoscere arbitramur unumquodque, cum causas primas et prima principia cognoscimus, et usque ad elementa), manifestum quidem quod quae sunt circa principia scientiae quae de natura est, prius determinare tentandum.

When the objects of an inquiry in any department have principles, conditions, or elements it is through acquaintance with these that knowledge, that is to say scientific knowledge, is attained. For we do not think that we know a thing until we are acquainted with its primary conditions or first principles, and have carried our analysis as far as its simplest elements. Plainly therefore in the science of Nature, as in other branches of study, our first task will be to try to determine what relates to its principles.

Innata autem est ex notioribus nobis via et certioribus, in certiora naturae et notiora. Non enim eadem nobis nota et simpliciter. Unde quidem necesse secundum modum hunc procedere ex incertioribus naturae, nobis autem certioribus, in certiora naturae et notiora. Sunt autem primum nobis manifesta et certa confusa magis : posterius autem ex his fiunt nota elementa et principia dividentibus haec. Unde ex universalibus ad singularia oportet procedere.

The natural way of doing this is to start from the things which are more knowable and obvious to us and proceed towards those which are clearer and more knowable by nature ; for the same things are not 'knowable relatively to us' and 'knowable' without qualification. So in the present inquiry we must follow this method and advance from what is more obscure by nature, but clearer to us, towards what is more clear and knowable by nature. Now what to us is plain and obvious at first is rather confused masses, the elements and principles of which become known by later analysis. Thus we must advance from generalities to particulars.

Totum enim secundum sensum notius est : universale autem totum quoddam est. Multa enim comprehendit ut partes universale.

For it is a whole which is best known to sense-perception, and a generality, is a kind of whole, comprehending many things within

Sustinent autem idem hoc quodammodo et nomina ad rationem. Totum enim quoddam et indistincte significant, ut puta circulus. Definitio autem ipsius dividit in singularia.

Et pueri primum appellant omnes viros patres et feminas matres : posterius autem determinant horum unumquodque.

it, like parts. Much the same happens in the relation of the name to the formula. A name, e.g. ' round ' means vaguely a sort of whole ; its definition thus analyses this into its particular senses.

Similarly a child begins by calling all men ' father ' and all women ' mother,' but later on distinguishes each of them.[1]

I. THE FIRST PART OF THE " PROOEMIUM " TO THE " PHYSICS "

In the first paragraph of the *Prooemium*, Aristotle shows that we must begin the study of nature with a consideration of the principles.[2]

Quoniam quidem intelligere et scire contingit circa omnes scientias, quarum sunt principia aut causae aut elementa, ex horum cognitione (tunc enim cognoscere arbitramur unumquodque, cum causas primas et prima principia cognoscimus, et usque ad elementa), manifestum quidem quod quae sunt circa principia scientiae quae de natura est, prius determinare tentandum.

When the objects of an inquiry, in any department, have principles, conditions, or elements, it is through acquaintance with these that knowledge, that is to say scientific knowledge, is attained. For we do not think that we know a thing until we are acquainted with its primary conditions or first principles, and have carried our analysis as far as its simplest elements. Plainly, therefore, in the science of Nature, as in other branches of study, our first task will be to try to determine what relates to its principles.

St. Thomas reduces the argument of this first sentence to a syllogism in which is contained everything given in Aristotle except the proof of the major. This syllogism is very clear and, I think, the best instrument we can use in our study of the text.

In omnibus scientiis quarum sunt principia aut causae aut elementa, intellectus et scientia procedit ex cognitione principiorum, causarum et elementorum.

Sed scientia quae est de natura, habet principia, elementa et causas.

Ergo in ea oportet incipere a determinatione principiorum.[3]

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1. *The Basic Works of Aristotle* (edited by R. McKeon) Random House, New York, 1941, *Physics* (translated by R. P. Hardie and R. K. Gaye), p.218.

2. *Physics*, I, chap.1, 184 a 9-15.

3. St. Thomas, *In I Physicorum*, lect.1, n.15.

A) The Major Premiss

The major premiss reads as follows.

In every science which has principles, causes or elements, understanding and science proceed from a knowledge of these principles, causes and elements.

This statement is actually a restatement of the definition of science which Aristotle treated in the First Book of the *Posterior Analytics*. What Aristotle is saying here is simply this. Science depends on knowledge of causes. The proof which he gives is the same proof as that given in the *Posterior Analytics*, common opinion. At this stage in the orderly progression of knowledge, we are not yet ready for a strict definition of science. We are no more ready now than we were in the logical tracts. Thus just as when he gave the definition of science in the *Posterior Analytics* he started with the words *scire opinamur*,[1] here, too, he begins with the words *tunc enim cognoscere arbitramur*.[2]

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1. " Scire autem opinamur unumquodque simpliciter, sed non sophistico modo, quod est secundum accidens, cum causam arbitramur . . ." *Posterior Analytics*, I, chap.2, 71 b 8-12. The English translation reads : " We suppose ourselves to possess unqualified scientific knowledge . . ."

2. In both the *Posterior Analytics* and the *Physics* when he treats the meaning of the word ' science,' ARISTOTLE begins with the imposition given the word by the common run of men. As ST. THOMAS points out, he is following here a principle laid down in the *Topics*. " Significatio autem nominis accipienda est ab eo, quod intendunt communiter loquentes per illud nomen significare : unde et in II *Topicorum* dicitur quod nominibus utendum est, ut pluribus utuntur." *In I Posteriorum*, lect. 4, n. 33. The reference is to *Topics*, II, chap.2, where ARISTOTLE tells us that words are to be used as the multitude uses them, although the significance of things behind the words is to be sought from the learned. Thus we should call ' healthy ' that which gives health. This is common usage. But when we wish to find out what is actually health-giving, we should consult the learned. " Praeterea definire oportet qualia vocanda sint, ut multi vocant, qualia non. Hoc autem utile est . . . Veluti quod iis nominibus res sunt appellandae, quibus multi utuntur ; cum quaeritur quales res sint, ejusmodi vel non ejusmodi, non est amplius sequenda multitudo. Exempli gratia salubre vocandum est, quod valet ad sanitatem efficiendam, ut multi vocant; an autem quod propositum est, ad sanitatem efficiendam valeat necne, non est amplius dicendum ut multi dicunt, sed ut medicus." It would seem that this reasoning could be applied to the use of the word ' science ' today. The tendency is to restrict it to the so-called mathematical and experimental sciences. Philosophy is looked on as something different from science. But the reason why common usage attributes it to mathematical sciences, seems to be that most people today think that mathematical sciences give causes and ultimate explanations. Actually as scientists themselves admit, it is highly hypothetical and dialectic. Scientists ' construct ' hypotheses. They do not find causes. Common usage would still like to find causes and reasons. The common usage of the word ' science ' is not to be sought in scholarly treatises but on billboards and television sets. " Science " proves that Colgates prevents tooth-decay. People buy Colgates not because of hypothetical constructions but because it (cause) can prevent tooth-decay (effect). According to common usage, science still means knowledge of causes.

This, the very first sentence, of natural science takes up the doctrine which has been so carefully taught in the logical treatises. This is the first sentence in the development of the *modus proprius* of natural science and is really the final word of the *modus communis* of all science. We have science when we know causes.

Although the general meaning of this major premiss is clear nevertheless it will be well here to examine the words which Aristotle uses to express this common mode of science. We can expect that these words will have a special significance for natural science. We shall briefly consider the words '*intelligere*' and '*scire*' and then proceed to the words '*causa*,' '*elementa*' and '*principia*.'

1. *Understanding and Science*

Aristotle begins by saying that both understanding and science begin from a knowledge of principles, causes and elements. The Greek words are τὸ εἰδέναι and τὸ ἐπισασθαι. The Latin translation of William of Moerbeke reads *intelligere et scire*. The English translation of Hardie and Gaye treats the phrase as hendiadys (the object of an inquiry) and thus loses precision.

According to St. Thomas the *intelligere* refers to definitions and the *scire* to demonstrations.[1] In other words, both definitions and demonstrations are based on a knowledge of causes. That this is true of demonstrations, is obvious from the very definition of demonstration as laid down in the *Posterior Analytics*. "Assuming then that my thesis as to the nature of scientific knowledge is correct, the premisses of demonstrated knowledge must be true, primary, immediate, better known than and prior to the conclusion which is further *related to them as effect to cause*."[2] In what sense, however, do definitions depend on a knowledge of causes? Obviously any definition which is strictly a definition will be according to one or more causes. But that is not the question here. Here the question comes down to this : How does a definition depend on knowledge of a cause or how does one definition depend on another? Definition can depend on cause or on another definition in so far as a definition differs from a demonstration only *positione*. For an explanation of this, St. Thomas refers us to his commentary on the *Posterior Analytics*.[3]

Definitions of one and the same thing can vary according to the cause on which the definition is based. Thus we may define a house from its final cause as 'a shelter which protects us from the elements.' We may define it from its material cause as 'shelter made of bricks,

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1. "Quod autem dicit *intelligere*, refertur ad definitiones ; quod vero dicit *scire*, ad demonstrationem." *I In Phys.*, lect.1, n.9.

2. *Posterior Analytics*, I, chap.2, 71 b 19-22.

3. *In I Posteriorum*, lect.16, n.139.

stone or wood.' Now, there is an order among the causes. The material cause depends on the formal cause in so far as the material must be such as demanded by the form. The formal cause in turn depends on the efficient cause in so far as *omne agens agit sibi simile.* Finally the efficient cause depends on the final cause for no agent acts without an end. *Omne agens agit propter finem.* Thus the final cause is the first cause on which all others depend. Definition from the final cause is the cause of all other definitions. *Oportet ergo quod definitio, quae sumitur a fine, sit ratio et causa probativa aliarum definitionum, quae sumuntur ex aliis causis.*[1]

Thus, for example, the definition of a house from its final cause may be the principle of a demonstration in which the conclusion is the definition of a house from its material cause. The demonstration would read something like this :

All constructions which are to protect us from the elements should be made of wood, cement or stone.
But a house is to protect us from the elements.
Therefore a house should be made from wood, cement or stone.

Here we have one definition demonstrated by another. We may, however, join the two definitions into one. A house is a construction whose purpose it is to protect us from the elements and whose matter is cement, wood or stone. This last definition contains everything that was in the demonstration. Such a definition differs from demonstration only *positione.* It contains all of the elements of demonstration but they are not ordered according to mode and figure.

Thus when Aristotle says that *intelligere* and *scire* both depend on knowledge of causes he is referring to demonstrations and to those definitions which may be demonstrated by other definitions or which differ from demonstration only *positione.*

2) *Principles, Causes and Elements*

We are thought to know a thing scientifically when we know its first principles, its first causes and when we have carried our analysis to its elements. What does Aristotle mean here by the words ' principles,' ' causes ' and ' elements.'

In the *Posterior Analytics* the very definition of science is given in terms of ' cause ' and the premisses of demonstration are described as ' principles.' The word ' element ' does not formally enter into the discussion at that point. Nor, in the *Posterior Analytics,* does Aristotle go into a study of the meaning of the words ' principle ' and ' cause.' He leaves such a study to the Fifth Book of the *Metaphysics* where he is distinguishing the common meanings of names.

1. *In I Posteriorum,* lect.16, n.139.

What meaning then should be attributed to them in the *Posterior Analytics*? Once again we have to fall back on the principle laid down in the *Topics*.[1] We must accept the usage common to all men. Principle and cause then, meant the same thing to Aristotle as they meant in common usage and as they meant in Greek Philosophy up to that time.

In the Fifth Book of the *Metaphysics*, Aristotle considers the meanings of the common words which are used in the study of first philosophy. These words have many impositions and it is these impositions which he enumerates. First philosophy, however, as any science, studies a subject, its causes and its passions and consequently will use words signifying all three. Thus Aristotle begins by studying the words which signify causes. These are three : 'principle,' ' cause ' and ' element.' They are treated in the order of decreasing generality. ' Principle ' is a term more extensive than ' cause ' while ' cause ' is more extensive than ' element.' [2]

The first word which Aristotle studies in the Fifth Book of the *Metaphysics* is the word ' principle.' Since the word is analogous not univocal, he does not start with a common definition of it but rather first enumerates the various impositions and then tries to abstract something which is common to all of them.

' Beginning ' means

1. that part of a thing from which one would start first, e.g. a line or a road has a beginning in either of the contrary directions.

2. that from which each thing would best be originated e.g. even in learning we must sometimes begin not from the first point and the beginning of the subject, but from the point from which we should learn most easily.

3. that from which, as an immanent part, a thing first comes to be, e.g. as the keel of a ship and the foundation of a house, while in animals some suppose the heart, others the brain, others some other part, to be of this nature.

4. that from which, not as an immanent part, a thing first comes to be, and from which the movement or the change naturally first begins, as a child comes from its mother and its father, and a fight from abusive language.

5. that at whose will that which is moved is moved and that which changes changes, e.g. the magistracies in cities, and oligarchies and monarchies and tyrannies are called *archai* and so are the arts, and of these especially the architectonic arts.

6. that from which a thing can first be known — this is also called the beginning of the thing, e.g. the hypotheses are the beginnings of demonstrations. Causes are spoken of in an equal number of senses for all causes are beginnings.

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1. *Loc. cit.*

2. " Procedit autem hoc ordine, quia hoc nomen Principium communius est quam Causa : aliquid enim est principium, quod non est causa ; sicut principium motus dicitur terminus a quo. Et iterum causa est in plus quam elementum. Sola enim causa intrinseca potest dici elementum." St. Thomas, *In V Metaph.*, lect.1, n.750.

It is common, then, to all beginnings to be the first point from which a thing either is or comes to be or is known. Hence the nature of a thing is a beginning, and so is the element of a thing, and thought and will, and essence and the final cause — for the good and the beautiful are the beginning both of the knowledge and of the movement of many things.[1]

According to the first imposition of the word, it signifies that part of a magnitude from which local motion takes its beginning. It implies some sort of order and process and these ideas are found in all of the other impositions. All causes can be called principles, but not all principles are causes. And even when they are one and the same thing the *ratio* of principle differs from that of cause. Principle implies order while cause implies influx of being.[2]

The treatment of the word ' cause ' (*αἰτία*) in the *Metaphysics* is a bit different than is that of ' principle.' Aristotle does not give the different impositions of the word but gives its species. The etymology of the word is rather obscure and nothing definite can be said about it.[3] Perhaps the simplest explanation of the word is that it answers the question ' why.'[4]

Now, the causes being four, it is the business of the physicist to know about them all, and if he refers his problem back to all of them, he will assign the ' why ' in the way proper to the science . . .

The question ' why ', then, is answered by reference to the matter, to the form, and to the primary moving cause.[5]

As was mentioned above, the word ' cause ' always implies influx of being and consequently it carries the notion that one being depends on another.

The word ' element ' signifies something less common than either ' principle ' or ' cause.' It is confined to the realm of material causality. Aristotle defines it as : " the primary component immanent in a thing, and indivisible in kind into other kinds." [6]

This definition includes four things : First of all it is something from which something is composed (*ex quo*), consequently an element is

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1. *Metaphysics*, V, chap.1, 1012 b 34-1013 a 24.

2. " Principium ordinem quemdam importat ; hoc vero nomen Causa, importat influxum quemdam ad esse causati." ST. THOMAS, *ibid.*, 751.

3. See J. M. LE BLOND, *Logique et Méthode chez Aristote*, Librairie Philosophique J. Vrin, Paris, (1939), p.93, note 3.

4. " Connaître la cause, pense ARISTOTE, c'est connaître le ' pourquoi ', le *διοτι*, Mais les questions et les pourquoi peuvent être d'ordre très différent." Le BLOND, *ibid.*. p.94.

5. *Physics*, II, chap.7, 198 a 22-24 ; 33-34.

6. *Metaphysics*, V, chap.3, 1014a27-28. The Latin translation reads : " Elementum vero dicitur ex quo aliquid componitur primo inexistente indivisibili specie in aliam speciem."

in the line of material causality. Secondly it is that from which a thing is *first* (*primo*) composed. Thus we would not call brass the element of a statue for the brass itself is composed of something already existing. Thirdly the element is immanent in the thing (*inexistente*). Consequently privation and contraries cannot be considered as elements. Thus even though a *musical man* becomes so from having been an *unmusical man* nevertheless we do not call the *unmusical man* an element. Fourthly an element is already constituted in a species but it cannot be further reduced (*indivisibili specie in aliam speciem*). Thus prime matter is not an element.

Examples of true elements are the following. The letters of the alphabet are elements of words, the first demonstrations of geometry or any science are the elements of the science. Those bodies into which are resolved composite bodies in the natural world are elements. Thus for Aristotle the elements would be earth, air, fire and water.

Thus the word ' principle ' can signify any source of origin whether it be a cause or not ; the word ' cause ' can signify any of the four causes and the word ' element ' signifies the ultimate material cause which is already constituted in a species. Now what do these words signify in the context of the *Prooemium* of the *Physics* ?

In the *Prooemium*, Aristotle is speaking about demonstration and definition, consequently all three of these words should signify some type of causality even though the word ' principle ' strictly speaking is more general than the word ' cause.' Obviously, too, each of the words is used to designate different kinds of causality. Actually it does not seem too important to determine what Aristotle had in mind as to the causality signified by each word. There are many and varied interpretations. It may be noted that St. Albert differs here from St. Thomas. Here we will but explain the interpretation offered as probable by St. Thomas and which has its own reasonableness.[1]

The word ' principle ' seems to stand for the efficient cause in so far as from its very first imposition, it indicates a process. ' Cause ' means dependance in *fieri* or in *esse*, consequently it seems to signify the formal and final causes while ' element ' in its usual sense indicates the material cause.

Thus we are thought to know a thing scientifically when we know its efficient, formal, final and material causes, that is, when we know its principles, causes and elements.

However, as St. Thomas points out, Aristotle does not say that we know a thing when we know its principles, causes and elements.[2] Rather he says that we know a thing when we know either its principles or its causes or its elements. He uses not the copulative ' and ' but

1. For other interpretations see LE BLOND, *op. cit.*, p.285, note.

2. ST. THOMAS, *In I Phys.*, lect.1, n.12.

the disjunctive 'or.' This he does to indicate that not all sciences demonstrate by all four causes. Mathematics demonstrates only by formal cause ; metaphysics principally by formal and final but also by efficient ; natural science, however, demonstrates from all four causes.

St. Albert adds some helpful considerations on this passage. Mathematics by definition abstracts from motion. Where there is no motion, there is neither efficient nor final cause for an efficient cause is that which moves the moved (*movet motum*) while a final cause is obtained by motion. Consequently, mathematics which abstracts from motion treats neither efficient nor final cause. Mathematics also abstracts from matter for matter is the subject of motion. Consequently, the demonstrations of mathematics are confined to formal causality. On mathematics, then, St. Thomas and St. Albert agree. St. Albert, however, considers metaphysics a bit differently from St. Thomas, at least as regards the interpretation of the present text. Metaphysics considers all of the causes but not in so far as they are intrinsic components of the thing. It considers them in so far as they are reducible to being. Thus it is only natural science which considers principles, causes and elements precisely as such.

Et haec quidem sunt quae faciunt esse physicorum, quae quidem in nulla aliarum scientiarum realium adeo plene colliguntur sicut in scientia naturali: quoniam in mathematicis eo quod sine motu considerantur, nihil demonstratur per efficientem et finem : quia efficiens movet motum, et per motum attingit et acquirit finem : et ideo quae sine motu sunt, considerationem efficientis et finis habere non possunt. Similiter etiam mathematicus non curat materiam, eo quod abstrahit ab illa, propter hoc quod ipsa est subjectum motus : formam autem accipit solam secundum quod ab ipsa diffinitio accipitur, quae quod quid erat esse secundum quod subjicitur passioni quam probat inesse substantiae formali. Metaphysicus autem licet consideret omnes causas, non tamen considerat eas in eo quod causantes sunt : quia materiam et forman non considerat secundum quod ingrediuntur in rem quam componendo constituunt, sed potius secundum quod reducuntur in rationem substantiae quae est verum ens et principium aliorum quae metaphysicus attendit. Et ideo solius physicae est procedere ex principiis et causis et elementis secundum quod sunt hujusmodi.[1]

Thus, in the text of the *Prooemium*, when Aristotle says that knowledge, scientific knowledge, depends on knowledge of either principles or causes or elements, he is accurate. The disjunctive is used with a purpose, for it is not necessary that every science demonstrate by all four causes. Otherwise, mathematics would not be a science. As a matter of fact, it is only natural science which demonstrates from all four causes as such.

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1. ST. ALBERT, *Liber Physicorum*, I, Tract.I, caput V, p.11.

In this first sentence, then, of the *Prooemium*, Aristotle is merely restating in different words the definition of science. Science proceeds from principles, causes or elements, that is, it proceeds from at least one of the four causes.

St. Albert here raises an objection the discussion of which throws much light upon the meaning of this passage and on the interpretation of the words ' principle,' ' cause ' and ' element.'

According to the interpretation given, the principles of our knowledge of nature are the principles, causes and elements. These were interpreted as meaning the four causes of mobile being. These are principles of being. It may be objected, however, that when we speak about the principles of science, we should not speak so much about principles of being but rather about principles of knowledge. Thus while agent, end, form and matter are principles of being, dignities, suppositions and positions are principles of cognition. Now the question arises, by what right do we say that the four causes are the principles of science? Would it not be more accurate to say that the principles of science are the dignities, suppositions and positions? Could one then interpret the words ' principles,' ' causes ' and ' elements ' as referring to dignities, suppositions or positions?

St. Albert offers two possible solutions to this and chooses the first.

According to the first : knowledge of natural things depends on their principles of being. We know them through their causes. Thus in the science of nature the principles of being are identified with the principles of knowledge. There is, however, a difference. The same principles, the causes of things, are principles of knowledge in so far as they exist as universals in the mind. They are principles and causes of being in so far as they exist as singular and determined in individual natural agents. It should be noted here that St. Albert does not oppose natural science to the other sciences from this point of view, but he intimates that there is a difference.

Si autem aliquis dicat quod ista principia referuntur ad esse : sed principia ex quibus procedit scientia, sunt principia cognitionis : et ideo non habet locum hoc quod diximus. Scire debet, quod in physicis res non cognoscitur nisi ex principiis ex quibus est. Et ideo talia in physicis sunt principia cognitionis et esse : sed differenter, quoniam universaliter accepta prout sunt in ratione physicorum, sunt principia cognitionis : determinata autem in natura secundum esse agentia vel patientia, sunt principia esse.[1]

There is a second solution to this difficulty but this second solution rests on a completely different interpretation of the words ' principles ', ' causes ' and ' elements,' an interpretation which I have found in no other author and which St. Albert presents without any reference whatsoever.

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1. St. Albert, *Liber Physicorum*, I, Tract.I, caput V, p.11.

Granted that science should proceed from principles of cognition, then the ' principles,' ' causes ' and ' elements ' in the text are principles of cognition and are not principles of being. Now there are various kinds of principles of cognition. There are those which do not enter into a syllogism, such as the dignities. There are others which do enter into a syllogism, some of which are convertible, some of which are not. Sometimes demonstration proceeds from principles which are first and true, these are the ' principles.' Sometimes it proceeds from principles which depend on first principles and which are principles of further syllogism, these are the ' causes.' Finally there are principles which depend on the others but which are ultimate in so far as no other principles depend on them. These are the ' elements.'[1]

This solution is rejected by St. Albert as not being closely linked to the context. Nevertheless it does throw light on what he means when he says that the four causes are principles of being and of cognition.

3) *First Causes*

As we have mentioned above, the proof of this major proposition is the common opinion of men : " For we do not think that we know a thing until we are acquainted with its primary conditions or first principles and have carried our analysis as far as its simplest elements." It will be noted here that Aristotle speaks of first (*primas*) causes, first (*prima*) principles and that the analysis goes down to the elements (*usque ad*). What is the significance of these modifiers? Once again, St. Albert is very helpful.

In a given science, that is, in a science of which the subject genus is one, our knowledge depends on knowledge of principles, causes and elements within that genus. Thus for example natural science depends on our knowledge of all physical causes and not on all causes in general. Thus knowledge of first cause, here means first *physical cause*. It does not extend to all efficient cause for the first efficient cause is something beyond the study of physics and belongs to metaphysics. Nor does it extend to a final cause which is the final cause of all created being and which consequently goes beyond the genus of physics. Matter and form too, in so far as they are reduced to substance are not part of the science of nature, but rather belong to metaphysics.

Sed sciendum est quod scientia naturalis ex his non procedit nisi sumptis secundum ambitum communitatis et principiorum et causarum in suo genere. Et ideo omne principium physicum et omnem causam physicam accipit et colligit : sed tamen non omnem causam efficientem, nec

1. St. Albert, *Liber Physicorum*, I, Tract.1, caput V, p.12.

omnem finem. Si enim acciperet omnem causam efficientem, oporteret quod extenderet se ad aliquid non physicum : quoniam causa prima est efficiens per essentiam suam, et de illa non intendit physica, sed philosophia prima. Eodem autem modo est de fine ultimo, qui est finis universitatis, et est in prima causa, sicut in duce exercitus. Similiter autem forma reducta in principium substantiae secundum quod hujusmodi, et similiter materia, non sunt de intentione scientiae naturalis, nec ex talibus aliquid probatur in scientia naturali. Sed potius de efficiente qui movet per formam quae disponit ipsum ad movendum, et non per essentiam, sicut ignis qui movet per dispositionem calidi quod est in ipso, et similiter de fine qui includitur et acquiritur per motum talis efficientis, et de materia et forma secundum quod materia subjicitur motui et mutationi, et forma est finis generationis, intenduntur haec a physico : et sic nos in ista scientia procedemus ex istis.[1]

Consequently, the word ' first ' refers to the first cause in the line of mobile being. The first cause which is the unmoved mover is outside the genus of mobile being and consequently is not a principle of cognition in natural science. When the Unmoved Mover is treated in the *Physics* in the Eight Book, it is treated not as part of the subject of natural philosophy but as its term :

Dicendum quod de primo motore non agitur in scientia naturali tanquam de subjecto vel de parte subjecti, sed tanquam de termino ad quem scientia naturalis perducit. Terminus autem non est de natura rei cujus est terminus, sed habet aliquam habitudinem ad rem illam, sicut terminus lineae non est linea, sed habet ad eam aliquam habitudinem. Ita etiam et primus motor est alterius naturae a rebus naturalibus, habet tamen ad ea[s] aliquam habitudinem, in quantum influit eis motum, et sic cadit in consideratione[m] naturalis, scilicet non secundum ipsum, sed in quantum est motor.[2]

It is to be further noted that the phrasing of the proof of this major takes a slight twist when it turns to the 'elements': ". . . Tunc enim cognoscere arbitramur unumquodque, cum causas primas et prima principia cognoscimus et usque ad elementa." At first reading, it might seem that the text means that we proceed from knowledge of the final, efficient and formal causes to a knowledge of the elements and that once these are known the science is complete. This, however, is not true. True science does not end with a knowledge of the elements but begins with them. The elements are principles of science as are the principles and causes. What the text means is that among the principles of a science, that is, among the four causes, it is the material cause, the elements which are known last.[3]

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1. St. Albert, *Liber Physicorum*, I, Tract.1, caput V, p.12.

2. St. Thomas, *Expositio in Boethium de Trinitate*, q.V, a.2, ad 3.

3. " Dicit autem *usque ad elementa*, quia id quod est ultimum in cognitione est materia. Nam materia est propter formam ; forma autem est ab agente propter finem,

The reason for this is that matter is the last of all the causes. It is the end or final cause which determines the form and it is the form which determines the matter. The purpose of a saw is to cut, thus it must have teeth But if the teeth are to be capable of cutting they must be made of iron.

B) The Minor Premiss

The syllogism which we are considering reads as follows :

In all sciences which have principles, causes or elements, definitions and demonstrations proceed from a knowledge of principles, causes or elements.

But the science of nature has principles, causes and elements.

Therefore the science of nature should begin with a consideration of the principles, causes and elements.

The major premiss of this syllogism as we have seen is proven by a sign, namely the common opinion on the meaning of science. The minor premiss is neither stated explicitly by Aristotle nor proven by him. It is St. Thomas who states it explicitly but he gives no proof. Now what does this minor premiss mean? It means quite simply that there is a science of nature. If there is a science of nature, it necessarily has principles. But there is a science of nature and therefore it does have principles. This minor then is stating the possibility and existence of a science of nature.

In the *Prooemium*, Aristotle does not state explicitly that a science of nature is possible nor does he prove it. He presupposes it. Presupposing the minor as St. Thomas states it, he is presupposing the possibility of a science of nature. He is perfectly justified in doing this for here he is proceeding *prooemialiter*. He presupposes that there is a science of nature and then proceeds to prove it in the rest of the *Physics* by determining the principles, causes and elements of mobile being as much as is possible. As we mentioned above, frequently in a *Prooemium* it is necessary to demand an act of faith of the reader. Actually, that is what Aristotle is doing here. He is, however, quite conscious of the objections against the very possibility of the science of nature. *The first objection* would come from the very denial of nature and of motion. It is this objection which he meets in the whole of Book One. Stricly speaking, we should expect the study of the *Physics* to start with Book Two where he discusses the subject and middle term of natural science. But before he can do this, he must make sure that he has defended the very possibility of true change and mobility.

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nisi ipsa sit finis : ut puta dicimus quod propter secare serra habet dentes, et ferreos oportet eos esse ut sint apti ad secandum." *In I Phys.*, lect.1, n.14.

Canon Mansion in his discussion [1] of the First Book of the Physics points out very clearly the position of the discussion of the principle of mobile being in the *Physics*. For historical reasons, that is, because of the varying interpretations of the very fact of motion, Aristotle had to determine the principles of mobile being before even determining the principles of the science of mobile being. Further, if there is no possibility of absolute change such as is defended in the First Book of the *Physics*, there is no possibility of a true science of nature. If all motion is to be reduced to accidental motions as had been done by Aristotle's predecessors, then there is no possibility of a science between metaphysics and a mechanical explanation of movement in the universe.

There is a second objection which may be raised against the possibility of a science of nature. This comes not from the notion of nature but rather from the notion of science. Nature is contingent while science is of the necessary. How then can there be a science of nature?

Aristotle had answered this question in the *Posterior Analytics* when he discussed the possibility of demonstration concerning corruptible beings. Consequently the question does not arise for him in the *Physics*.

In Chapter Eight of the First Book of the *Posterior Analytics*, Aristotle shows that there can be no demonstration about corruptible things. The reason for this is that if the propositions of a syllogism must be universal, so too must the conclusion. The universality of the propositions of demonstration had been discussed when he treated the principle *dici de omni*. However, although *simpliciter loquendo* there is no demonstration about corruptible things, it is possible *secundum accidens*.

> It is clear also that if the premisses from which the syllogism proceeds are commensurately universal, the conclusion of such demonstration — demonstration, i.e., in the unqualified sense — must also be eternal. Therefore no attribute can be demonstrated nor known by strictly scientific knowledge to inhere in perishable things. The proof can only be accidental . . .[2]

St. Thomas in his commentary explains the meaning of the distinction *per se* and *per accidens*. It is true that science is only of the incorruptible and eternal. Consequently it seems that there is no science of sensible beings for they are corruptible. It was by this

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1. A. MANSION, *Introduction à la Physique aristotélicienne*, Louvain, Éditions de l'Institut supérieur de philosophie, 2nd ed, (1954), pp.53,54,79.

2. *Posterior Analytics*, I, chap.8, 75 b 21-25. The Latin translation here reads : " Manifestum est autem et si sint propositiones universales, ex quibus est syllogismus, quod necesse est et conclusionem esse perpetuam hujusmodi demonstrationis, et simpliciter ut est dicere demonstrationis. Non est ergo demonstratio corruptibilium nec *scientia simpliciter*, sed sic, sicut est *secundum accidens*."

reasoning that Plato was forced to his doctrine of ideas. For Aristotle, however, corruptible beings may be the subject of a science not *per se* but *per accidens*. By *per se* he means corruptible beings in so far as they exist as individuals and thus are corruptible. By *per accidens* he means corruptible beings in so far as they are considered under their universal aspects. Of these there is science.[1]

The minor premiss then, as stated by St. Thomas is presupposed by Aristotle in the *Prooemium*. There is a science of nature. The possibility of a science of corruptible beings is proven in the *Posterior Analytics* and the possibility of absolute change is proven in the First Book of the *Physics*.

C) The Conclusion

The conclusion of the syllogism as stated by St. Thomas reads :

Therefore, in the science of nature, we must begin with a consideration of principles.

The science of nature must begin with a consideration of the principles. As St. Albert points out, if there is real science, there is procedure from principles and causes. If these principles and causes are not known, then the procedure is not scientific and demonstrative but rather dialectical or rhetorical. Argument will not be based on causes but on common intentions and circumstances. The result will be but opinion or presumption. The reason for this is that principles, causes are essential while argument from intentions and circumstances are but extrinsic.

It will be well to quote this passage here in full for it manifests briefly and clearly the Aristotelian position on the relation between science and dialectic.

Quoniam quidem igitur de principiis corporis mobilis sermo nobis est habendus, oportet nos tentare determinare prima principia in naturali scientia. Natura enim omnis scientiae talis est, quod si ipsa habet principia et causas et elementa, intelligere et scire non accidit in ipsa nisi ex cognitione istorum quae dicta sunt. Cum enim intellectus in scientiis non sit nisi habitus et acceptio principiorum ex quibus sciuntur alia, scire autem sit accipere conclusionem quae sequitur ex illis principiis, oportet

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1. " Sciendum est autem quod quia demonstratio non est corruptibilium, sed sempiternorum, neque definitio, Plato coactus fuit ponere ideas. Cum enim ista sensibilia sint corruptibilia, videbatur quod eorum non posset esse neque demonstratio, neque definitio . . . Sed huic opinioni occurrit Aristoteles superius dicens quod demonstratio non est corruptibilium nisi per accidens. Etsi enim ista sensibilia corruptibilia sint in particulari, in universali tamen quamdam sempiternitatem habent. Cum ergo demonstratio detur de istis sensibilibus in universali, non autem in particulari, sequitur quod demonstratio non sit corruptibilium, nisi *per accidens* ; sempiternorum autem est *per se*." ST. THOMAS, *In I Posteriorum*, lect.16, nn.140-141.

quod omnis scientia quae vere scientia est, initium processus sui habeat a principiis primis usque ad principia proxima. Dico autem quod omnis scientia quae habet principia sic procedit, et illa sola est vere scientia : quia est demonstrativa et effectus solius demonstrationis est scire. Si autem ipsa non habeat verum nomen scientiae, tunc ipsa erit scientia topica dialecticae vel rhetoricae, et effectus ejus non erit scientia, sed opinio, vel suspicio sive praesumptio : et ideo non habet principia et causas et elementa ex quibus procedit, sed habebit considerationes topicas quas sumit aut ex intentionibus communibus quae nulli conveniunt proprie, sed inveniuntur in pluribus, sicut dialectica : aut sumit eas ex circumstantibus negotium vel personam, sicut facit rector. Nullum autem istorum est alicujus rei principium vel causa vel elementum : quia omnia principia et causae et elementa sunt essentialia et propria rei : qualia non sunt ea quae in logicis vel rhetoricis assumuntur. Quod autem in omni scientia cujus vere est scire, oporteat esse processum a primis in genere suo principiis usque ad elementa, patet quia (sicut dictum est in *Posterioribus Analyticis*) tunc opinamur nos cognoscere unumquodque quod scimus vere, quando cognoscimus prima in genere principia ejus, et causas ejus, et elementa ejus ex quibus componitur, et non aliter.[1]

This passage which St. Albert puts at the very beginning of his *Physics*, has for its purpose to indicate the necessity of principles and causes for scientific knowledge. Actually it is a summary of some very important points already discussed in logic but which are very important for the process of the science of nature. Science proceeds from principles, causes and elements. If these are unattainable, then science is not possible. All that can be attained is opinion, suspicion or presumption. These are effected not by science but by dialectic or rhetoric. Instead of causes and principles the arguments will proceed from ' loci,' from common intentions or from circumstances.

As we shall see in the discussion of the second part of the *Prooemium*, natural science proceeds from the general to the particular, that is, it proceeds from mobile being in general down to the species of mobile being and then down to the subspecies. Now, knowledge of the principles and causes of mobile being in general is not too difficult to come by. Common experience suffices. But once we have passed these very general conclusions, it is very difficult to determine the principles, causes and elements. For the most part it is impossible. Consequently at that point, we no longer have science but on the principles of Aristotle, St. Thomas and St. Albert who puts it all rather briefly here, we should pass to something that is akin to dialectic. We pass into the realm of the probable. However, I do not know of any passages where Aristotle, St. Thomas or St. Albert discuss the problem in these terms. They do speak in the *Topics* of the research

1. ST. ALBERT, *Liber Physicorum*, I, Tract. A, caput V, p.10.

of principles but I do not think they are teaching the exact thing as we are here.

One wonders what St. Albert would have added to this passage were he conscious of the power of mathematics as an instrument of knowledge. He speaks of the '*loci*.' But these have actually not been a fruitful instrument. Mathematical physics has been much more effective.

D) The First Section as Prooemium

This first section of the *Prooemium* obviously proceeds *prooemialiter* in the sense in which we have described this word above. The ideas are highly concentrated and there is an appeal made to the faith of the student in the words of the master. Aristotle from this very first sentence of the *Physics* uses words which are very pregnant with meaning ; science and understanding (with all they imply of demonstration and definition), principle, cause and element. From this very first sentence he is introducing us into a science of nature contrary to the general trend of Greek philosophy before him as exemplified in Plato and Heraclitus. There is a science of nature. Nature is subject to definition and demonstration. It has principles, causes and elements in itself and our study of nature begins with these.

II. THE SECOND PART OF THE "PROOEMIUM" OF THE "PHYSICS"

Innata autem est ex notioribus nobis via et certioribus, in certiora naturae et notiora. Non enim eadem nobis nota et simpliciter. Unde quidem necesse secundum modum hunc procedere ex incertioribus naturae, nobis autem certioribus, in certiora naturae et notiora.

The natural way of doing this is to start from the things which are more knowable and obvious to us and proceed towards those which are clearer and more knowable by nature ; for the same things are not 'knowable relatively to us' and 'knowable' without qualification. So in the present inquiry we must follow this method and advance from what is more obscure by nature, but clearer to us, towards what is more clear and more knowable by nature.

Sunt autem primum nobis manifesta et certa confusa magis : posterius autem ex his fiunt nota elementa et principia dividentibus haec. Unde ex universalibus ad singularia oportet procedere.

Now what is plain and obvious at first is rather confused masses, the elements and principles of which become known to us later by analysis. Thus we must advance from generalities to particulars ;

Totum enim secundum sensum notius est : universale autem totum

For it is a whole that is best known to sense-perception, and a generality

quoddam est. Multa enim comprehendit ut partes universale.

Sustinent autem idem hoc quodammodo et nomina ad rationem. Totum enim quoddam et indistincte significant, ut puta circulus. Definitio autem ipsius dividit in singularia.

Et pueri primum appellant omnes viros patres et feminas matres : posterius autem determinant horum unumquodque.

is a kind of whole, comprehending many things within it, like parts.

Much the same happens in the relation of the name to the formula. A name, e.g. ' round,' means vaguely a sort of whole : its definition analyses this into its particular senses.

Similarly a child begins by calling all men ' father ' and all women ' mother,' but later on distinguishes each of them.[1]

In the first part of the *Prooemium*, Aristotle has shown that the science of nature, as any science, must begin with a consideration of its principles, causes and elements. Science according to the strict sense of the word is the result of demonstration. Demonstration, however, is based on principles, causes and elements. Consequently, before we can proceed in a science we must know the principles, causes and elements.

Now, in the second part of the *Prooemium*, Aristotle gives the answer to a question which is fundamental to the whole study of nature. Granted that we must begin with principles, with what principles do we begin ? Do we begin with the principles, causes and elements of a particular species or do we rather begin with the principles causes and elements of nature in general ?

Aristotle's answer to this question is clear both from what he says here in the *Prooemium* and from the actual order which he followed in his natural works. We begin with general principles and proceed to a study of the particular kinds of mobile being. In the *Prooemium*, Aristotle manifests this order of procedure in the philosophy of nature in two steps. First of all, he proves it in a syllogism which he presents according to the proper mode of a *Prooemium*. Secondly, he further explains it by presenting three extrinsic proofs or signs.

In analyzing this section of the text of Aristotle, we shall once again employ as most apt instrument of manifestation, the commentary of St. Thomas and especially the syllogism which he proposes.

A) The Syllogism proposed by St. Thomas

St. Thomas reduces the first part of this second half of the *Prooemium* to a syllogism which reads as follows :

Innata est nobis via ut procedamus incipiendo ab iis quae sunt nobis magis nota in ea quae sunt magis nota naturae.

1. *Physics*, I, chap.1, 184 a 17-184 b 14.

Sed ea quae sunt nobis magis nota sunt confusa, qualia sunt universalia. Ergo oportet nos ab universalibus ad singularia procedere.[1]

We shall study the major premiss and the minor premiss of this syllogism in order and shall then proceed to the objections which St. Thomas proposes.

1. *The Major Premiss*

"It is natural for us to proceed in knowledge from that which is more known to us towards that which is more known by nature." What does Aristotle mean by this statement?

The Greek text reads as follows :

Πέφυκε δὲ ἐκ τῶν γνωριμωτέρων ἡμῖν ἡ ὁδὸς και σαφεστέρων ἐπὶ τὰ σαφέστερα τῇ φύσει και γνωριμώτερα.

There are five words in this text which demand brief but close examination.

1. γνωριμωτέρων, which in Latin is translated by the word *notior*, is perhaps best translated into English not by the word 'more known' but 'more knowable.' However, frequently in the explanation of the doctrine here explained we shall translate it by 'more known.' The proper translation seems to vary according to the context. The word used here is the comparative of γνωρίμος which means easily known. According to one of its first impositions, it signifies a famous person who is well known, easily known.

2. σαφεστέρων is translated into Latin by the word *certior*, and into English by the word 'more certain.'

3. ἡμῖν. In the context, Aristotle speaks of that which is more knowable and more certain *to us*. The *us* refers to man with the capabilities and limitations of his knowledge.

4. φύσει. In the context, Aristotle opposes 'to us' (ἡμῖν) and 'by nature' (φύσει). At times this word is best translated 'according to nature.' The Latin translates it by the dative (*naturae*) which means 'to nature.' In the next sentence, Aristotle substitutes the word 'simply' (ἁπλῶς) for the word 'nature.' The opposition is between that which is more knowable to us and that which is more knowable 'by nature,' 'to nature,' 'according to nature' or *simpliciter*. Hardie and Gaye translate the (ἁπλῶς) by the phrase 'without qualification.'

5. Πέφυκε. Aristotle tells us that it is *innate* to us to proceed from the more knowable to us to the more known by nature. This is a process dictated by our very nature.

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1. ST. THOMAS, *In I Phys.*, lect.1, n.15.

The major as presented here seems quite simple and perhaps in need of no explanation. Nevertheless, it is a statement of elements which have been established by Aristotle in other treatises. Here we shall make an analysis of these elements as they are established in other sections of the Aristotelian corpus. It should be noted here again that this is a *Prooemium* and in a *Prooemium*, Aristotle depending on the natural faith of the students can bring together elements which might perhaps be proven in later treatises.

Now the question to be answered here is this : What do we mean when we say that the natural mode of procedure for us is from the more knowable to us to the more knowable in itself ?

First of all, what is more knowable to us ? In the *Summa Theologica* when he considers the origin of our knowledge, St. Thomas refers us back to the First Book of the *Metaphysics* and to the last chapter of the *Posterior Analytics*. " Sed contra est quod Philosophus probat, *I Metaph.* et in fine *Post.* quod principium nostrae cognitionis est a sensu."[1] In both of these passages which are quite similar to each other, Aristotle explains the origin of our intellectual knowledge and universals. In both of them the considerations are rather common and may be understood antecedently to a detailed knowledge of natural science. In the last chapter of the *Posterior Analytics*, Aristotle is explaining the origin of the indemonstrable principles of the syllogism. He shows how knowledge of them comes not from other premisses but rather from sense knowledge. All animals possess sense knowledge. Some have the power of retaining sense impressions even when the object sensed is no longer present. This power we call memory. Man, however, over and above the power of memory has experience by which he can collate these memories. It is from this experience that he abstracts the universal with which he begins both art and science.

> So out of sense-perception comes to be what we call memory, and out of frequently repeated memories of the same thing develops experience ; for a number of memories constitute a single experience. From experience again — i.e. from the universal now stabilized in its entirety within the soul, the one beside the many which is a single identity within them all — originate the skill of the craftsman and the knowledge of the man of science, skill in the sphere of coming to be and science in the sphere of being.[2]

As St. Thomas points out,[3] just as experience depends on memory, so does science depend on experience. Our scientific knowledge

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1. St. Thomas, *Ia Pars*, q.84, a.6, sed contra.

2. *Posterior Analytics*, II, chap. 19, 100 a 4-8.

3. " Hoc est ergo quod dicit, quod sicut ex memoria fit experimemtum, ita etiam ex experimento, aut etiam ulterius ex universali quiescente in anima . . . ex hoc igitur experimento, et ex tali universali per experimentum accepto, est in anima id quod est principium artis et scientiae." St. Thomas, *In II Posteriorum*, lect.20, n.592.

has its origin in the senses. That which is first known to us and most known to us is, consequently, the sensible world around us. This is the principle of all our knowledge. It is not, however, merely a transient principle but remains throughout.

Dicendum quod phantasma est principium nostrae cognitionis, ut ex quo incipit intellectus operatio, non sicut transiens sed sicut permanens, ut quoddam fundamentum intellectualis operationis, sicut principia demonstrationis oportet manere in omni processu scientiae, cum phantasmata comparentur ad intellectum ut objecta, in quibus inspicit omne quod inspicit vel secundum perfectam repraesentationem vel per negationem.[1]

The phantasm is the starting point and abiding principle of all of our knowledge. Consequently it is sensible substance which is most known to us. Any object which does not act on our senses, of which we have no phantasm, is least knowable to us. Thus it is that the separated substances are the least known to us. We do not know them by infused forms nor by forms abstracted from phantasms.[2] We know them only by their effects. We argue from effects to cause (*via causalitatis*). Arrived at the cause, we pursue our investigation by denying in spiritual substances the limitations of matter (*via negationis*). Finally we affirm whatever excellence we see in the material world but that only in an eminent way (*via eminentiae*). We do not, however, arrive at a knowledge of the essence. We know more about what they are not than about what they are. The least knowable to us is separated substance.

If that which is more knowable to us, is sensible substance, what is it which is more knowable in itself? That which is more knowable in itself is that which is least knowable to us, namely, the separated substances. Things are more knowable in so far as they are in act.[3] The separated substances freed from all limitations of matter are more act than are sensible substances, and consequently are more knowable in themselves. God who is pure act is most knowable.

We have here the two poles of human knowledge. There is that which is more knowable to us, namely, sensible substance and that

1. St. Thomas, *De Trinitate*, q.VI, a.2, ad 5.

2. " Immediate quidem intellectus noster ferri non potest secundum statum viae in essentiam Dei et in alias essentias separatas, quia immediate extenditur ad phantasmata, ad quae comparatur sicut visus ad colorem, ut dicitur in *III de Anima*." St. Thomas, *De Trinitate*, q.VI, a.3, c. On the question of our knowledge of God and the separated substances and on the ways of causality, negation and eminence see : *In I Posteriorum*, lect.30, n.254 ; lect.41, n.363 : *Summa Contra Gentiles*, I, cc.14, 30 ; *De Trinitate*, q.I, a.2 ; *De Potentia*, q.7, a.5, ad 2.

3. " Sic igitur concludit Philosophus manifestum esse, quod quando aliqua reducuntur de potentia in actum, tunc invenitur earum veritas. Et hujus causa est, quia intellectus actus est. Et ideo ea quae intelliguntur, oportet esse actu. Propter quod, ex actu cognoscitur potentia." St. Thomas, *In IX Metaph.*, lect.10, n.1894. See also *Metaphysics*, IX, chap.9, 1051 a 23-35.

which is less knowable to us but more knowable in itself, the separated substances. Now what is the order of learning each of these substances? Obviously we begin with that which is more knowable to us. All discipline begins with that which is more knowable to the disciple. It is in beginning from the knowledge of the disciple, that one progresses toward knowledge of that which is unknown.

> Cum enim omnis disciplina fiat per ea quae sunt magis nota addiscenti, quem oportet aliqua praecognoscere ad hoc ut addiscat, oportet disciplinam nostram procedere per ea quae sunt magis nota quo ad nos, quae sunt saepe minus nota secundum naturam, ad ea quae sunt notiora secundum naturam, nobis autem minus nota.[1]

It is for this reason that in the Seventh Book of the *Metaphysics*, Aristotle begins his discussion of substance with sensible substance and then proceeds to a discussion of the separated substances.

Several things should be noted about this major premiss as we have discussed it thus far. First of all, Aristotle in expressing it confines himself to generalities. He merely states that we proceed from what is more knowable to us towards what is more knowable in itself. He further states that the two are not identified. He does not discuss the reasons for this which we, following St. Thomas, have indicated, namely the origin of our knowledge in the senses and the relation between intelligibility and actuality. Secondly in his explanation of Aristotle, St. Thomas points out that what is more knowable to us is the sensible world and that what is more knowable in itself is spiritual reality. However, he does not point out that within the realm of the sensible world, our knowledge proceeds from that which is more potential and consequently less knowable in itself toward that which is more actual and consequently more knowable in itself. Actually this point comes up in the minor premiss where we learn that the process is from the more universal to the particular.

Thirdly, it will be well to point out here the difference there is between St. Thomas's explanation of the term 'knowable in itself' and that of St. Albert. For St. Thomas, when we say that something is more knowable to nature, we do not mean that nature knows but rather that the thing in itself has a high degree of intelligibility. St. Albert, however, interprets the phrase differently. For him, when we say that a thing is more knowable to nature, we look on nature as knowing the thing and making it. Thus for St. Albert nature would know first of all the elements from which it made the whole universe, somewhat as the builder who would first know the bricks, then the walls of a house.[2] Our knowledge, however, of the universe is just the

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1. St. Thomas, *In VII Metaph.*, lect.2, n.1301.

2. "Sed nota quod cum natura ista quae producit res ex suis causis, operetur per causas, oportet quod causae essentialiter res componentes sint notiores apud naturam quam

contrary. We do not know the elements but rather the whole. Our knowledge of the universe is not that of the artist who composes but of the speculative scientist who resolves. It is to be noted, that St. Thomas who must have known the text of St. Albert explicitly denies this interpretation. " Non ergo dicit nota naturae, quia natura cognoscat ea ; sed quia sunt nota secundum se et secundum propriam naturam." [1]

2. *The Minor Premiss*

The minor premiss as proposed by St. Thomas reads as follows :

Sed ea quae sunt nobis magis nota sunt confusa, qualia sunt universalia.[2]

In this minor premiss, Aristotle tells us precisely what it is that is more knowable to us. That which is more knowable to us, is something confused. Further, this confused something is a universal. Consequently, our knowledge begins with something which is confused and universal. At first glance, there seems to be an opposition between what Aristotle says here and what St. Thomas said in his explanation of the major premiss. St. Thomas, as we have seen, explains the major premiss in terms of sensible substance and spiritual substance. We proceed from sensible substance to spiritual. It should be noted, too, that this interpretation of St. Thomas is not arbitrary, for he is giving Aristotle's ordinary teaching on the more known to us and the more known to nature. However, when Aristotle comes to this middle term, he seems to reverse his field. He does not speak of a process from sensible to spiritual substance but rather of a process from ' confused masses, the elements and principles of which become known to us by later analysis.'

To reconcile what Aristotle says here and what St. Thomas says in his explanation of the major premiss, we must go to the interior of that which is more knowable to us, namely sensible substance and study what aspect of sensible substance is more knowable to us. In this minor premiss Aristotle is carrying the analysis a further step. He is looking at the interior of the " more known to us." In the world of sensible substance that which is more known is a confused whole and

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res composita : quia aliter non uteretur natura elementalibus principiis pro instrumentis suae compositionis : et sic optime notum apud naturam est elementum ex quo operatur, et post hoc optime notum est compositum quod componit . . . Ex his manifestum est quod natura novit animalia per animam et corpus organicum physicum. . . Hic ergo est processus notitiae naturae quae componit res, et ex principiis accipit notitiam earum, ita semper quod illa sint ei notissima quibus proxime utitur in opere compositionis." ST. ALBERT, *Liber Physicorum*, I, Tract.I, caput VI, pp.13-14.

1. ST. THOMAS, *In I Phys.*, lect.1, n.18.

2. ST. THOMAS, *In I Phys.*, lect.1, n.15.

from it we proceed to its principles and elements. The whole process of our knowledge can be described in three steps rather than in the two which were explained in the major premiss. First is known the confused whole of the sensible world, then the elements of the sensible world and then only do we arise to spiritual substance which is more known in itself. We are not interested in the third step. Our concern here is with the process in the interior of the sensible world.[1] What does Aristotle mean when he says that we proceed from confused wholes to principles and elements, from universals to particulars?

> Now what to us is plain and obvious at first is rather confused masses, the elements and principles of which become known to us by later analysis. Thus we must advance from generalities to particulars.[2]

We shall try to answer this question by explaining what Aristotle means by confused knowledge and universals. These two notions go hand in hand and it is impossible to speak of one without speaking of the other. Nevertheless at the risk of confusing more than clarifying, we shall study them separately.

a) Confused knowledge. Aristotle describes the knowledge with which we begin as 'confused.' The Greek word is *συγκεχυμένα*. This is the past participle of *συγ χέω*. This original Greek word carries very well the meaning which we wish to explain here. It means poured or mixed together. Things are poured together and we do not see them distinctly. Their distinction is not grasped but they are seen together in confusion.

St. Thomas explains the origin and nature of this confused knowledge in the *Summa Theologica* when he treats the question : *Utrum magis universalia sint priora in nostra cognitione intellectuali?* [3] His argumentation proceeds as follows. The human intellect before it has acquired knowledge is like an empty blackboard. It is a passive potency and must proceed from potency to act.[4] Whatever proceeds from potency to act must first come to an incomplete act which is half way between potency and perfect act. Now, the perfect act to which the human intellect can come is perfect science in which things are known distinctly and determinately. "We think that we know a thing

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1. As was mentioned above, the *motor immobilis* is not part of the subject of the philosophy of nature. It is studied in the philosophy of nature either as the term of the motion of the subject or as its principle. See ST. THOMAS, *De Trinitate*, q.V, a.2. ad 3.

2. *Physics*, I, chap.1, 184 a 22-25.

3. *Ia Pars*, q.85, a.3.

4. "Have we not already disposed of the difficulty about interaction involving a common element, when we said that mind is in a sense potentially whatever is thinkable, though actually it is nothing until it has thought? What it thinks must be in it just as characters may be said to be on a writing-tablet on which as yet nothing actually stands written : this is exactly what happens with mind." ARISTOTLE, *De Anima*, III, chap.4, 429 b 20-430 a 2. See also ST. THOMAS, *Ia Pars* q.79, a.2, c.

scientifically when we know its causes . . ." The imperfect act of the intellect lacks this distinction. Things are known indistinctly in sort of a confusion. However, when we know something in which many things are contained without knowing the things distinctly, we have confused knowledge.[1] Confused knowledge, therefore, implies knowledge of some sort of a whole. The whole may be either a universal whole in which the parts are known in potency.[2] Thus knowing ' animal ' we know man in potency. Or the whole may be an integral whole in which we do not see the parts distinctly.

When we know only the whole as, for example, ' animal ' our knowledge is indistinct and confused. When, however, we know the parts as ' rational ' and ' irrational ' our knowledge is distinct.

St. Thomas then shows that knowledge of the confused is knowledge of the more universal. This point, however, does not interest us for the moment. What we are interested in is the meaning of confused knowledge. As is obvious from the discussion, an understanding of the word ' confused ' implies an understanding of what we mean by ' whole.'

In his *De Divisione*, Boethius gives us four meanings of the word ' whole.' These are explained by St. Albert and are taken up frequently by St. Thomas.

> Quod enim dicimus totum, multipliciter significamus. Totum namque est, quod continuum est, ut corpus vel linea, vel aliquid hujusmodi.
>
> Dicimus quoque totum, quod continuum non est, ut totum gregem, vel totum populum, vel totum exercitum.
>
> Dicimus quoque totum, quod universale est, ut hominem vel equum. Hi enim sunt toti suarum partium, id est hominum vel equorum, unde et particularem unumquemque hominem dicimus.
>
> Dicitur quoque totum, quod ex quibusdam virtutibus constat, ut animae alia est potentia sapiendi, alia sentiendi, alia vegetandi ; partes sunt, sed non species.[3]

St. Albert explains well these four meanings of the word ' whole.'[4] First of all, he notes that the word is not univocal but analogous. In its first sense it means something that is continuous. Here ' continuous ' is taken in a very large sense : anything which is continuous or put together by nature or by art. It may be a body, a line, a house.

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1. ' Manifestum est autem quod cognoscere aliquid in quo plura continentur, sine hoc quod habeatur propria notitia uniuscujusque eorum quae continentur in illo, est cognoscere aliquid sub confusione quadam." *Ia Pars*, q.85, a.3.

2. " Sic autem potest cognosci tam totum universale, in quo partes continentur in potentia, quam etiam totum integrale : utrumque enim totum potest cognosci in quadam confusione, sine hoc quod partes distincte cognoscantur." *Ibid.*

3. BOETHIUS, *De Divisione* in S. ALBERTI MAGNI, *Commentarium in Librum Boethii de Divisione* (edit. De Loe, Bonn, 1913), Tract. IV, Caput I, Textus Boethii.

4. *Ibid.*

The ' whole ' here means anything put together integrally. This is the integral whole (*totum integrale*) to which responds an integral part (*pars integralis*).[1]

In the second sense, a ' whole ' is any collection which is united under any form.[2] Thus a flock is a whole under one shepherd, a people is a whole under one government. This whole is called an ' ordered whole ' (*totum ordinabile*).

In a third sense, a universal is a whole. Thus ' man ' or ' horse ' may be considered wholes, the parts of which are a particular man or a particular horse. This is the whole which St. Thomas refers to as the ' universal whole.' The parts which correspond to it are called subjective parts.[3]

Finally in the enumeration of Boethius, there is the potestative whole (*totum potestativum*). This is a whole which is made up of different potencies and powers. Thus the human soul is endowed with rational potencies, sensitive potencies and vegetative potencies. To this whole, there corresponds the potestative part (*pars potestativa*).[4]

This is basically the doctrine of St. Thomas in the *Summa Theologica* where he divides the parts of the virtue of prudence :

> Dicendum quod triplex est pars : scilicet integralis, ut paries, tectum et fundamentum sunt partes domus ; subjectiva, sicut bos et leo sunt partes animalis ; et potentialis, sicut nutritivum et sensitivum sunt partes animae.[5]

Of the four kinds of wholes mentioned by Boethius and of the three mentioned by St. Thomas, only two are of interest to us when we consider the question of human knowledge.[6] The ordered whole and the potestative whole are of no concern to us here. In the *Summa Theologica*, when he discusses the confused knowledge with which we begin, St. Thomas speaks only of the integral whole and the universal whole.

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1. " Id enim, quod totum dicimus, multipliciter significamus, et haec multiplicitas est analogiae et non omnino univocae communitatis. Dicitur enim totum, quod continuitate totum est, ut continuitas largo nomine sumatur pro omnibus his, quae partibus compaginatis unum aliquid integrum constituunt, sive sint continua, sive per contactum sive per collam aliquam colligata . . ." *Ibid.*

2. " Dicimus etiam totum, quod non est continuum aliquo modorum, et quod nonnisi forma collectionis ad unum unitur." *Ibid.* " Secundo autem respondet pars, ut ita dicam, ad unum aliquo modo ordinabilis." *Ibid.*

3. " Dicimus etiam totum id, quod est universale, sicut dicimus totum hominem vel equum . . . Tertio autem respondet pars subiectiva vel subiicibilis." *Ibid.*

4. " Dicitur quoque totum, quod quasi medium est duorum, quod scilicet est totum potestativum, quod ex virtutibus et potestatibus quibusdam constat . . . Quarto autem respondet pars potestativa." *Ibid.*

5. *IIa IIae*, q.48, a.1, c.

6. We prescind here from the discussion of the *partes speciei* and *partes materiae* as found in the *De Trinitate*, q.V, a.3, corp. and in *In I De Coelo et Mundo*, Prooemium, n.2.

As our intellect proceeds from potency to act, it first knows a confused whole which can be either a *universal whole* or an *integral whole*. Thus the human mind first knows animal, the universal whole, and then by a process of induction and research will attain a distinct knowledge of the species of animal. It knows, too, man which is a whole, but at first only confusedly does it know the integral parts of man. At the end of the first book of the *Physics*, the natural philosopher knows the whole which is form but does not yet know the kinds of forms.

Just as discussion of confused knowledge has led us to a discussion of whole and part, so too, discussion of whole and part naturally leads us to a discussion of universals.

b) *Universals.* Now what to us is plain and obvious at first is rather confused masses, the elements and principles of which become known to us by later analysis. *Thus we must advance from generalities to particulars.*[1]

For Aristotle, the process from confused masses to elements is also a process from generalities to particulars. What does he mean here by 'generalities'? The Greek term in question is ἐκ τῶν καθόλου. Καθόλου is an adverb which means "in general," "on the whole." It is opposed both to τὰ καθ' ἕκαστα and to κάτα μέρος. The English translation which we have cited above gives 'generalization' which is correct. Since, however, the word 'universal' has taken on a technical meaning, 'universal' might be a better translation.

The word 'universal' has various impositions. Here we shall prescind completely from the non-philosophic ones. There is the universal in predication (*universale in praedicando*), the universal in signification (*universale in significando*), the universal in representation (*universale in representando*) and the universal cause (*universale in causando*). It is the first and last of these of which Aristotle speaks explicitly. The others have been disengaged from his teaching by the scholastics. We shall first speak of the universal in predication of which Aristotle speaks and then of the other impositions of the word.

In the Seventh Chapter of the *Peri Hermeneias* Aristotle discusses the division of enunciations according to their subjects. The subject of a proposition is a name. Names, however, signify concepts which are similitudes of things. Division of subjects and of names will consequently be based on division of things.[2] This division is twofold.

Some things are universal, others individual. By the term 'universal' I mean that which is of such a nature as to be predicated of many subjects,

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1. *Physics*, I, chap.1, 184 a 22-25.

2. "Praemittit autem divisionem enunciationum quae sumitur secundum differentiam subjecti . . . Subjectum autem enunciationis est nomem vel aliquid loco nominis sumptum. Nomen autem est vox significativa ad placitum simplicis intellectus, quod est similitudo rei ;

by ' individual ' that which is not thus predicated. Thus ' man ' is a ' universal,' ' Callias ' an individual.[1]

St. Thomas notes three things about this division. First of all, Aristotle is not to be interpreted here as attributing existence outside the mind to universals. He is speaking of things in the context of names and consequently he is speaking of them as they are in the intellect. *Et ideo oportet quod divisio ista rerum accipiatur secundum quod res cadunt in intellectu.*[2] Secondly, Aristotle does not define a universal as that which is predicated of many subjects but rather as that which is capable of being predicated of many subjects. *Quod natum est praedicari de pluribus.* If all men were dead save one, the word ' man ' would still be a universal.[3] Thirdly, it does not suffice for the notion of 'universal' that the name be predicable of many. The name and the *thing* must be predicable of many. Thus the fact that many men may be called Socrates does not make the name ' Socrates ' a universal. *Et ideo intelligendum est quod universale dicitur quando, non solum nomen potest de pluribus praedicari, sed id, quod significatur per nomen, est natum in pluribus inveniri.*[4]

This universal is that which the scholastics call the universal in predication or in being (*universale in praedicando vel in essendo*).[5] It is something which is apt to be found in many things and predicated of them. Thus ' animal ' is found in all animals and may be predicated of any animal.

It is of the universal in predication that Aristotle speaks in the last chapter of the *Posterior Analytics* where he shows the role of sense knowledge and induction in the formation of first principles.

This *universale in praedicando* is obtained not by the senses but by the intellect which abstracts from the singular conditions of the senses. The abstraction by which we obtain this *universale in praedicando* is called total abstraction. It is not our purpose here to make a thorough analysis of the Thomistic teaching on abstraction, nevertheless there are certain notions which must be clear if we are to understand the *Prooemium* of Aristotle.

St. Thomas speaks about abstraction of whole from part and of form from matter in two classic texts.

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et ideo subjectum enunciationis distinguit per divisionem rerum, et dicit quod rerum quaedam sunt universalia, quaedam sunt singularia." ST. THOMAS, *In I Peri Hermeneias*, lect.10, nn.118-119.

1. *Peri Hermeneias*, c.7, 17 a 37-40.

2. ST. THOMAS, *ibid.*, n.121.

3. *Ibid.*, n.122.

4. ST. THOMAS, *In I Peri Hermeneias*, lect.10, n.124.

5. JOHN OF ST. THOMAS, *Cursus Philosophicus*, I, *Logica*, II Pars, q.III, a.1 (edit. Reiser) p. 313b.

In the *Summa Theologica* we read :

Dicendum quod duplex fit abstractio per intellectum. Una quidem secundum quod universale abstrahitur a particulari, ut animal ab homine. Alia secundum quod forma abstrahitur a materia ; sicut forma circuli abstrahitur per intellectum ab omni materia sensibili.[1]

In this abstraction a whole is abstracted from a part. The whole is a potential whole, that is, one which contains the parts in potency. Animal contains both man and brute but only in potency. Of itself it abstracts from both of them. The parts from which this whole is abstracted are subjective parts. Man, giraffe, buffalo are the subjects in which animal is realized in the concrete. In proceeding in this abstraction, the intellect goes from that which is actual (man) to that which is potential (animal). The earth is inhabited not by indeterminate animals but by giraffes, donkeys and men.

In the *De Trinitate*, there is another kind of abstraction of whole from part. Here we read :

Unde cum abstractio non possit esse, proprie loquendo, nisi conjunctorum secundum rem, secundum duos modos conjunctionis praedictos, scilicet quo pars et totum uniuntur vel forma et materia, duplex est abstractio : una qua forma abstrahitur a materia, alia qua totum abstrahitur a partibus.

. . . Sed digitus, pes et manus et aliae hujusmodi partes sunt praeter intellectum hominis, unde ex eis ratio essentialis hominis non dependet et homo sine his intelligi potest. Sive enim habeat pedes sive non, dummodo ponatur conjunctum ex anima rationali et corpore mixto ex elementis propria mixtione, quam requirit talis forma, erit homo. Et hae partes dicuntur partes materiae, quae non ponuntur in definitione totius, sed magis e converso, et hoc modo se habent ad hominem omnes partes signatae, sicut haec anima et hoc corpus et hic unguis et hoc os et hujusmodi. Hae enim partes sunt quidem partes essentiae Socratis et Platonis, non autem hominis in quantum homo, et ideo potest homo abstrahi per intellectum ab istis partibus. Et talis abstractio est universalis a particulari.

Et ita sunt duae abstractiones intellectus : una quae respondet unioni formae et materiae vel accidentis et subjecti, et haec est abstractio formae a materia sensibili ; alia quae respondet unioni totius et partis, et huic respondet abstractio universalis a particulari, quae est abstractio totius, in qua consideratur absolute natura aliqua secundum suam rationem essentialem ab omnibus partibus, quae non sunt partes speciei sed sunt partes accidentales.[2]

Here, we have another kind of abstraction of whole from part. The parts from which the whole is abstracted are not subjective parts but what St. Thomas calls *partes materiae*. They are parts which are

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1. *Ia Pars* q.40, a.3, c.
2. Q.V, a.3.

extrinsic to the nature of the things. They are opposed to *partes speciei* which are essential for the composition of the nature. This abstraction gives an actual whole, namely a nature. Ultimately it gives a definition. Now this type of abstraction is necessary for all sciences, in so far as all true science begins with definitions, with natures.[1]

There are, then, two types of abstraction of universal from particular, of whole from part, one of which is explained in the *Summa Theologica* and the other in the *De Trinitate*. In the discussion of the *Prooemium* to the *Physics*, we are more particularly concerned with the first of these abstractions for it gives us a potential whole which is the same as the universal whole of which we spoke in the section on universals.

It should be noted, however, that from another point of view the abstraction of whole from part about which we speak here, is also of the type that we have explained in the *De Trinitate*. In a way it is a *totum actuale*. Animal, although it is a *totum potentiale* in comparison with man (and thus confused in comparison with man which is distinct), nevertheless is an actual whole itself which may be defined and may be the middle term in demonstration. Thus, too, in the philosophy of nature, although ' motion ' is potential with respect to the species of motion, nevertheless in itself it is definable and capable of being the middle term in the demonstrations of the *Physics*. Since, however, in the *Prooemium*, Aristotle is obviously speaking about the order of procedure, animal, motion, etc., would be considered as potential wholes.

Besides the *universale in praedicando*, there are other ' universals ' which are further impositions of the word. The *universale in praedicando* is proper to the human intellect, in so far as it is only the human intellect which proceeds in its knowledge from a potential whole. The human intellect proceeds thus because its knowledge is abstractive. It does not grasp the essence of a thing clearly and distinctly immediately but abstracts general characteristics and by a detailed and inductive study constructs its knowledge of the object. First of all, it abstracts the fact that an object is mobile, then that it is living, then that it senses, finally that it has intellectual powers. At each step it investigates the nature which experience reveals to it. It proceeds from a study of motion in general to a study of the kinds of motion. Thus the process is from the potential whole towards the actual existing whole. It may also be characterized as proceeding from potency to act, from confusion to distinction.

The angelic intellect, however, does not proceed according to this laborious process. The species which are the *medium* of angelic cognition are not abstracted from things but infused.

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1. ". . . Et haec competit etiam physicae et est communis omnibus scientiis, quia in omni scientia praetermittitur quod per accidens est, et accipitur quod per se est." *Ibid.*

Substantiae vero superiores, idest angeli, sunt a corporibus totaliter absolutae, immaterialiter et in esse intelligibili subsistentes ; et ideo suam perfectionem intelligibilem consequuntur per intelligibilem effluxum, quo a Deo species rerum cognitarum acceperunt simul cum intellectuali natura.[1]

These species are universals but their universality is not that of the universal in predication. It is not a universality abstracted from things but a universality which as it were precedes things. They are almost like the forms in the mind of an artist before he makes his house or whatever it be. They are called the *universale ad rem* or the *universale in representando*. The more perfect the angel the more universal the species.[2]

Besides the universal in predication and in representation there is another imposition of the word. According to this imposition, a name itself may be called universal in so far as it may be applied to many different objects. This is called the universal in signification (*universale in significando*).[3]

Finally by an imposition which is further from the first imposition than the rest, the word 'universal' may be applied to causes. A cause which has many effects is called a universal cause (*universale in causando*). John of St. Thomas defines it as *illud cujus virtus ad plures effectus se extendit, sive sit efficiens sive in alio genere causae.*[4] This is the universal of which Aristotle speaks in the Second Chapter of Book One of the *Metaphysics* where he explains the nature of the causes studied by the wise man.

Since we are seeking this knowledge, we must inquire of what kind are the causes and the principles, the knowledge of which is Wisdom . . .[5]

Such and so many are the notions, then, which we have about Wisdom and the wise. Now of these characteristics that of knowing all things must belong to him who has in the highest degree universal knowledge ; for he knows in a sense all the instances that fall under the universal. And these things, the most universal, are on the whole the hardest for men to know, for they are farthest from the senses.[6]

For the philosopher, then, there are four impositions of the word 'universal.' There is that which is most properly 'universal' the

1. *Ia Pars*, q.55, a.2. c.

2. " Sic igitur quanto angelus fuerit superior, tanto per pauciores species universitatem intelligibilium apprehendere poterit. Et ideo oportet quod ejus formae sint universaliores, quasi ad plura se extendentes unaquaeque earum." *Ibid.*, a.3, c.

3. " Universale in significando est signum aliquod, quod ipsum universale significat sive ad plura universaliter applicari potest ; sicut nomina seu termini communes significant rem in communi et ad plura applicari possunt, ut homo, animal." JOHN OF ST. THOMAS, *loc. cit.*

4. *Ibid.*

5. *Metaphysics*, I, chap.2, 982 a 5-7.

6. *Ibid.*, 982 a 20-25.

universal in predication. There is the universal in signifiying. There is the universal in representation which is less known to us than either of the first two. Finally there is the universal cause.

In his minor premiss following the text of Aristotle, St. Thomas identifies the *confusa* with the *universalia*. The universal of which he speaks here is the universal in predication. Obviously he is not speaking merely of the universal in signification. Nor could there be any question here of the universal in representation which is proper to angelic cognition. Finally he is not speaking of universal causes. Our knowledge does not begin with that which is most in act. Rather our knowledge begins in potency and tends toward act. It begins with the universal in predication which is a confused whole.

It should be noted here that although the term ' confused masses ' in itself may refer to an integral whole or to a universal whole, in the context it refers but to the universal whole. Aristotle himself equates the two and St. Thomas in his explanation here of confused and universal speaks only of the universal whole, the universal in predication.

3. *The Conclusion*

According to the major premiss of the syllogism which St. Thomas presents, the natural process of our knowledge is from that which is more known to us toward that which is more known in itself. According to the minor premiss, that which is more known to us is a confused whole, the universal in predication. The conclusion from these premisses is that we proceed from confused wholes and universals to particulars. *Ergo oportet nos ab universalibus ad singularia procedere.*

In the text of Aristotle, this conclusion is stated in two ways. First of all Aristotle tells us that we proceed from confused masses to the elements and principles which divide them. *Posterius autem ex his fiunt nota elementa et principia dividentibus haec.* Secondly he tells us that this is a process from the general to the particular. *Unde ex universalibus ad singularia oportet procedere.*

The process by which we proceed from confused masses to the principles and elements which distinguish these masses is the same as that by which we proceed from universals to particulars. Confused knowledge is as we have seen knowledge of a whole. Distinct knowledge would be knowledge of the parts of that whole. Thus knowledge of a potential whole such as ' animal ' would be made distinct by knowledge of ' rational ' or ' irrational.' Starting from a knowledge of the principles and elements of animal, we proceed to a knowledge of the principles and elements of rational animal or irrational animal. We are capable of making certain demonstrations on the level of confused knowledge. We may make certain demonstrations about animal. However, the natural bent of our mind carries us on toward demonstrations on the level of the distincts species of animal, rational

and irrational. In the case of ' animal,' the principles and elements which divide it are ' rational ' and ' irrational.'

However, these confused masses may also be considered as universals and the principles which divide them as particular species under the universals. Thus Aristotle tells us that we proceed from universals to particulars. The Greek text reads as follows : Διὸ ἐκ τῶν καθόλου ἐπὶ τὰ καθ' ἕκαστα δεῖ προιέναι. It should not be thought that the καθ' ἕκαστα refers to singular individuals. There is no science of individuals. All science demands a certain amount of universality. The reference rather is to particular species within the same genus.

The reason for this process from the universal to the particular is that knowledge of the universal remains potential. It holds a place between pure potency and ultimate act. Knowledge as nature is perfect when it is in act. Knowledge then must not rest in the common, confused and universal but must proceed toward the proper, distinct and particular. St. Thomas explains this well in his *Prooemium* to the *Meteorologica.*

> Sicut in rebus naturalibus nihil est perfectum dum est in potentia, sed solum tunc simpliciter perfectum est, quando est in ultimo actu ; quando vero medio modo se habens fuerit inter puram potentiam et purum actum, tunc est quidem secundum quid perfectum, non tamen simpliciter ; sic et circa scientiam accidit. Scientia autem quae habetur de re tantum in universali, non est scientia completa secundum ultimum actum, sed est medio modo se habens inter puram potentiam et ultimum actum. Nam aliquis sciens aliquid in universali, scit quidem aliquid eorum actu quae sunt in propria ratione ejus : alia vero sciens in universali non scit actu, sed solum in potentia. Puta, qui cognoscit hominem solum secundum quod est animal, solum scit sic partem definitionis hominis in actu, scilicet genus ejus : differentias autem constitutivas speciei nondum scit actu, sed potentia tantum. Unde manifestum est quod complementum scientiae requirit quod non sistatur in communibus, sed procedatur usque ad species : individua enim non cadunt sub consideratione artis ; non enim eorum est intellectus, sed sensus.[1]

Having completed his explanation of the syllogism which proves that the process of our knowledge is from the universal to the particular and before taking up the study of the three signs by which Aristotle further explains what he means, St. Thomas raises an obvious objection to the doctrine as taught and secondly refutes the interpretation given to this whole passage by the Commentator. Both of these points are most important and will be studied in detail now.

4. *Objections to the Syllogism*

According to what Aristotle has taught here in the *Prooemium,* that which is more known to us is the universal while the singular is

1. *In I Meteorologicorum*, lect.1, n.1.

more known according to nature. This, however, seems to contradict the teaching of the *Posterior Analytics* according to which sensible singulars are more known to us while universals are more known according to nature. St. Thomas discusses this question both here and in his commentary on the passage in the *Posterior Analytics*.

In the second chapter of Book One of the *Posterior Analytics*, Aristotle discusses demonstration and science. In explaining the relationship between the propositions of a demonstration and the conclusion, he states that the propositions are the causes of the conclusion and are consequently more knowable than the conclusion. As we have seen, however, a thing may be more knowable in two ways ; either more knowable to us or more knowable according to nature. That which is more knowable to us is that which is closer to the senses. That which is more knowable in itself is further removed from the senses. As Aristotle points out, however, that which is furthest removed from the senses and consequently the less knowable to us is the universal while that which is closest to the senses and more knowable to us is the singular.

> Now ' prior ' and ' better known ' are ambiguous terms, for there is a difference between what is prior and better known in the order of being and what is prior and better known to man. I mean that objects nearer to sense are prior and better known to man ; objects without qualification prior and better known are those further from sense. Now the most universal causes are furthest from sense and particular causes are nearest to sense, and they are thus exactly opposed to one another.[1]

At first glance this seems to contradict the doctrine proposed in the *Prooemium* to the *Physics*.

The difficulty, however, is resolved by considering the context in which each of the horns of the dilemma is posed. In the *Posterior Analytics*, Aristotle is speaking about the entire realm of human knowledge comprising as it does both sense knowledge and intellectual. According to this consideration, that which is first known to us is the sensible singular. That which is most knowable in itself is the object of intellectual knowledge, namely the intelligible in act which is a universal in so far as it has been abstracted from the individuating conditions of sensible matter.

In the *Physics*, however, Aristotle is speaking not of the order of human knowledge in its entirety but rather of the order within the realm of intellectual knowledge where we proceed from the more universal to the less universal. Here the universal in question is directly the universal in predication, the *universale in praedicando*. In the *Physics*, the relation is between the more universal and the less universal, for the word ' singular ' here means not the sensible indi-

1. *Posterior Analytics*, I, chap.2, 71 b 33-72 a 6.

vidual but rather the individual species which are more known in themselves than are the genus which contain them only in potency. Animal contains man in potency. The species constituted in act is man.

St. Thomas explains this a little further by a sign drawn from generation. In all generation, that which is in potency is prior in time but posterior in nature to that which is in act. In human cognition, however, knowledge of the genus is, as it were, potentially knowledge of the species. When the species is known, then the essence of the thing is known. Thus in the generation of human knowledge the more common is known before the less common.

In omni enim generatione, quod est in potentia est prius tempore et posterius natura, quod autem est completum in actu est prius natura et posterius tempore. Cognitio autem generis est quasi potentialis, in comparatione ad cognitionem speciei, in qua actu sciuntur omnia essentialia rei. Unde in generatione scientiae nostrae prius est cognoscere magis commune quam minus commune.[1]

This same difficulty about the priority of our knowledge of universals arises in the First Book of the *Metaphysics* where Aristotle shows that it is the function of Wisdom to study universal causes. The difficulty is the same, but the answer of St. Thomas at this point more clearly indicates the role of the universal in causation and the universal in predication than do the commentaries of the *Posterior Analytics* or the *Physics*.

At this point in the *Metaphysics*, Aristotle is showing that Wisdom embraces the study of the first and universal causes. The argument has been from the common opinion of men on the meaning of Wisdom. Wisdom among other qualities has this, namely, that it seems to imply knowledge of the most difficult things. The most difficult things to know however are the more universal for they are more remote from the senses. Consequently it is the function of Wisdom to consider universal causes. " And these things, the most universal, are on the whole hardest for man to know ; for they are farthest from the senses." [2]

In his commentary on this text, St. Thomas indicates the apparent contradiction with the *Prooemium* of the *Physics*. " Sed contra hoc videtur esse quod habetur primo *Physicorum*. Ibi enim dicitur quod magis universalia sunt nobis primo nota. Illa autem quae sunt primo nota, sunt magis facilia."

The answer given here by St. Thomas is very clear, and accurately summarizes the relationship between the universal in causation and

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1. *In I Posteriorum Analyticorum*, lect.4, n.16.
2. *Metaphysics*, I, chap. 2, 982 a 32-24.

the universal in predication. We shall first quote the text in full, then give our own paraphrase.

Sed dicendum, quod magis universalia secundum simplicem apprehensionem sunt primo nota, nam primo in intellectu cadit ens, ut Avicenna dicit, et prius in intellectu cadit animal quam homo. Sicut enim in esse naturae quod de potentia in actum procedit prius est animal quam homo, ita in generatione scientiae prius in intellectu concipitur animal quam homo. Sed quantum ad investigationem naturalium proprietatum et causarum, prius sunt nota minus communia ; eo quod per causas particulares, quae sunt unius generis vel speciei, pervenimus in causas universales. Ea autem quae sunt universalia in causando, sunt posterius nota quo ad nos, licet sint prius nota secundum naturam, quamvis universalia per praedicationem sint aliquo modo prius quo ad nos nota quam minus universalia, licet non prius nota quam singularia : nam cognitio sensus qui est cognoscitivus singularium, in nobis praecedit cognitionem intellectivam quae est universalium.[1]

According to our simple apprehensions, it is the more universal which is first known. Thus we first know being, then animal and finally man. For just as in natural generation first an animal is generated and then man for which it was in potency, so in the generation of knowledge, first we know animal and then man. However, in our investigation of the properties and causes of natural beings what we know first is the less common in so far as by a study of causes proper to particular genera or species we arrive at knowledge of universal causes. Those things, however, which are universal causes are known last by us, although they are first known according to nature. On the other hand the universals by predication (*universalia per praedicationem*) are in a way more known by us than the less universal although they are not known before the singulars because sense knowledge precedes intellectual. Sense knowledge, however, is of the singular ; intellectual is of the universal.

This text shows admirably the relation between our knowledge of the singular and that of the universal, the relation between the universal cause (*universale in causando*) and the universal in predication (*universale in praedicando*), and finally the relation between particular causes and universal causes.

That which we know first is the sensible singular. That which we know last is the universal cause (*universale in causando*) which transcends the senses but which is most knowable in itself. The object of Wisdom is the universal cause. Within the realm of intellectual knowledge, the first which we know is the most general, that is the universal in predication (*universale in praedicando*). Proceeding by way of greater concretion, we proceed from the universal (*animal*) to the singular (*man*). However, the quest for knowledge

1. St. Thomas, *In I Metaph.*, lect.2, n.46.

has not finished. For once we know the singulars, namely, the particular species as men, elephants, natural elements, etc., we rise again but this time not in the direction of the more potential (*totum potentiale*), but in the direction of the more actual which is the universal cause and which is known by us only through its effects.

5. *Averroes*

Having proven that our knowledge begins with universals, Aristotle proceeds to clarify this doctrine by means of three signs. St. Thomas comments on each of these signs. Before, however, he does this, he explains and refutes the interpretation of the whole passage which is proposed by Averroes. The distinction proposed here by St. Thomas in explanation of his own interpretation is most important for an understanding of the philosophy of nature.

As we have seen, according to the interpretation of St. Thomas, this second part of the *Prooemium* is concerned with proving one thing, namely that in the philosophy of nature we begin by determining the more universal principles. This was proven in the syllogistic form. The major of this syllogism said that science begins from that which is more known to us and proceeds towards that which is more knowable in itself. This major was found in the text of Aristotle beginning with the words *Innata autem est ex notioribus*.

The minor of the syllogism showed that actually what is more known to us is the confused and the more universal. This minor was found in the text of Aristotle beginning with the words : *Sunt autem primum nobis*. Thus for St. Thomas there is a unity of thought here. Aristotle is showing the order in which we should determine the subjects to be treated in the philosophy of nature. St. Thomas calls this order, *ordo in determinando*.

Averroes interprets Aristotle differently.[1] According to him, Aristotle in this text is talking about three different things. In the section beginning *Innata autem*, he is describing not the order in which we determine the subjects of the philosophy of nature, *ordo determinandi*, but rather the order of demonstration, *ordo demonstrandi*. Here Aristotle is showing that in the demonstrations of the philosophy of nature we proceed from that which is more known to us, namely from effects and that consequently the demonstrations of the philosophy of nature will be for the most part demonstrations of the fact (*demonstratio quia*). Demonstration of the reasoned fact will for the most part not be possible.

Now it is true that for the most part, the demonstrations of the philosophy of nature are from effects and consequently not demonstrations of the reasoned fact (*demonstratio propter quid*). St. Thomas

1. ST. THOMAS, *In I Phys.*, lect.1, n.22.

points this out very well both in his commentary on the *Posterior Analytics* [1] and in the *De Trinitate.*[2] But at this point in the text, Aristotle is interested in the order of determination of subjects (*ordo in determinando*).

According to the interpretation of Averroes, the words *Sunt autem primum* take up a second idea. Here Aristotle is showing that what is more known to us is the composite and that what is least known is the simple. Thus according to this interpretation, the word *confusa* means composite. That which is more known to us is the confused (composite).

Finally for Averroes, there is a third section which begins with the words *Unde ex universalibus.* Here, as a sort of corollary Aristotle adds that the order of procedure is from the more universal to the less.

As St. Thomas points out, this interpretation of Averroes is not acceptable. First of all, it compromises the unity of the passage. For St. Thomas, the unity is found in the fact that Aristotle is speaking of the order of determination (*ordo in determinando*). Averroes compromises that unity by having Aristotle speak of two orders, the order of demonstration and the order of determination. The second is added as sort of a corollary. If we accept the interpretation of St. Thomas, the unity of the passage is quite clear.

Secondly, St. Thomas points out against Averroes that there is no question here of the order of demonstration. Aristotle spends long sections in Book Two discussing the demonstrations of the philosophy of nature. Here he is concerned with the order of procedure.

Finally St. Thomas disagrees with Averroes interpretation of the word '*συγκεχυμένα.*' Averroes interprets it to mean 'composite' rather than 'confused.' The word '*confusa*' is taken up in the next sentence by the word 'universal.' The universal, however, is not composed of species, nor do we argue from universal to species. The universal is a confused whole containing the species indistinctly. We do not argue from universals to species but we proceed from universals to species.

B) The Three Signs

Aristotle concludes the *Prooemium* by proposing three extrinsic proofs of the fact that our knowledge begins with the confused. The

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1. "Item, quandoque id quod est notius quoad nos non est notius simpliciter, sicut accidit in naturalibus, in quibus essentiae et virtutes rerum, propter hoc quod in materia sunt, sunt occultae, sed innotescunt nobis per ea, quae exterius de ipsis apparent. Unde in talibus fiunt demonstrationes ut plurimum per effectus, qui sunt notiores quoad nos et non simpliciter." *In I Posteriorum Analyticorum*, lect.4, n.43 bis.

2. "Demonstratio quae est per signum vel effectum, maxime usitatur in scientia naturali." ST. THOMAS, *De Trinitate* q.VI, a.1.

first of these arguments is based on a comparison with a sensible whole.

> For it is a whole that is best known to sense-perception, and a universal is a kind of whole comprehending many things within it.[1]

The first sign is taken from our sense knowledge. That which is first known to the senses, is a whole. What is true of sense knowledge is also true of intellectual. What the intellect knows is a whole. A universal, however, is a sort of whole. Consequently, that which the intellect first knows is the more universal. It is to be noted that Aristotle here gives no example of what he means by the whole which is first known to the senses. Perhaps, a good example, would be taken from vision. We first see the whole house and only later examine in detail the roof, windows, door, etc.

In his commentary on this passage, St. Thomas notes that the whole about which we are speaking when we speak of sense knowledge is an integral whole. This, however, gives rise to an objection. For in the intellectual order, the whole under discussion is not the integral whole but rather the potential whole, the universal in predication. Therefore, since the parallel between sense and intellectual knowledge does not hold, it would seem that we cannot argue from the fact that the first known to the senses is an integral whole to the fact that the first known to the intellect is a potential whole.

St. Thomas answers this objection by pointing out that there is enough similarity between a potential whole and an integral whole to argue from one to the other at least on the point in question. It is common both to the integral whole and to the potential whole to be in a way confused. As wholes, they both contain their parts not distinctly but in a certain amount of confusion. Thus a genus, a potential whole, does not contain its species distinctly but in confusion. So, too, one who sees a house does not immediately distinguish the parts. They are seen in confusion. Thus, just as in the senses we begin with an integral whole, in intellectual knowledge we begin with a potential whole.

St. Thomas makes one last remark concerning this sign. This remark refers back to the interpretation of Averroes according to which the word *confusa* meant *composita*. For this sign to have any value, it is necessary that there be something in common between the sensible whole and the universal. What is common to both of them, is that they are both confused, *confusa*. They are not however both composites (*composita*). The sensible whole is a composite but the universal is not. The sensible whole is composed of the integral parts,

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1. *Physics*, I, chap.1, 184 a 25-27. The Latin translation reads as follows : " Totum enim secundum sensum notius est : universale autem totum quoddam est. Multa enim comprehendit ut partes universale."

as the house is composed of walls, roof and floor. A genus, however, is not composed of species. Thus in this whole passage, what Aristotle is discussing is the confused (*confusa*) not the composite (*composita*).

The second extrinsic proof or sign is taken from the realm of definition. Just as we first know a name which is sort of a whole and then know the definition which is, as it were, the parts, so our knowledge begins with wholes and proceeds to parts. " Much the same happens in the relation of the name to the formula. A name, e.g. ' round ' means vaguely a sort of whole ; its definition analyses this into its particular senses." [1] That which is to be defined is as it were, an integral whole. The defining elements are its parts. What we know first is this whole, as for example, first we know this name ' man.' There is a certain confusion here. Later we know the defining parts and thus we go as from a whole to parts, as from a universal to singulars. Thus Aristotle adds the sentence. *Definitio autem ipsius dividit in singularia.* In all of this section, we must remember the precise point which Aristotle is trying to manifest, namely that we proceed from whole to part, from universal to particular, from confused to distinct.

This second sign is an argument from the relation between a name and the elements which define it. There are, however, two objections to this argument. First of all, it would seem that the defining elements (*definientia*) since they are more universal than that which is defined (*definitum*) should be first known to us. Secondly that which is defined (*definitum*) should be notified by the defining elements (*definientia*). Consequently, the defining elements should be more known to us. For we notify a thing not by that which is more obscure but by that which is more known.

In answer to this objection, St. Thomas points out that although in themselves the defining elements are first known to us, nevertheless the object to be defined is known before we know that it is defined by such and such elements. We know animal and rational before we know man. But we know man at least confusedly before we know that animal and rational are its defining elements.

The third sign used by Aristotle is more easily understood. It is based on the way infants know their parents and distinguish them from other men and women.

> Similarly a child begins by calling all men ' father ' and all women ' mother,' but later on distinguishes each of them.[2]

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1. *Physics*, I, chap.1, 184 b 10-11. The Latin translation reads as follows : " Sustinent autem idem hoc quodammodo et nomina ad rationem. Totum enim quoddam et indistincte significant, ut puta circulus. Definitio autem ipsius dividit in singularia."

2. *Physics*, I, chap.1, 184 b 12-14. The Latin translation reads : " Et pueri primum appellant omnes viros patres et feminas matres : posterius autem determinant horum unumquodque."

A child first knows men in a certain confusion and consequently calls all men 'father.' Later on, however, it begins to distinguish among men. One is father and another is not. So too in our knowledge, we proceed from a confused knowledge to a distinct knowledge.

As St. Thomas points out, this third sign is based on a sensible universal. It will be recalled that the first sign was based on a sensible integral whole. This one is based on a sensible potential whole. According to the first sign, that which is known first is the sensible integral whole, for example, a house. It is only later that we know its integral parts, walls, roof, etc. According to this third sign, that which is known first is the potential whole, for example, this animal and then later we know its subjective parts, this man.

As St. Thomas points out, this priority is according to the senses and can be according to place or according to time. Thus as an object approaches from a distance, the senses will first perceive that it is a body, then that it moves, then that it is an animal, then that it is a man and finally that it is Socrates. This is according to the senses for the same thing is true of animals. The same thing is true according to time. First of all a child knows man and identifies all men with 'father' but as time goes on, it begins to distinguish one man from another.

It is with these three signs that Aristotle concludes his *Prooemium* to the *Physics*. It is difficult to find a reason for the order in which they are given. The first and the third seem more manifest than does the second. The third seems the most manifest of all. One may wonder why Aristotle adds the three. Perhaps the reason is that the doctrine is so important, that he uses as many signs as possible. Further, he states in the text that the *natural* process is from confusion to distinction. By immediately giving three different examples from common experience, he shows that it is natural. It is natural for us to know by the sense the whole before the part. It is natural that we have at least a confused idea of the meaning of a word before we can give a strict definition of it. And it is natural that children first know all men confusedly and later on distinguish their fathers from other men.

To the two parallel columns of translations of the *Prooemium* with which we began our commentary, it would have been quite simple to append a third which though not a translation of the text of Aristotle, reflects very well his thought. This third column would have been a citation from a recent article of Bertrand Russell in which the noted British philosopher traces his philosophic development since student days and outlines his philosophic pre-occupations and 'prejudices.' He writes as follows :

> This brings me to the last of my initial prejudices, which perhaps has been the most important in all my thinking. This is connected with

method. My method invariably is to start from something vague but puzzling, something which seems indubitable but which I cannot express with any precision. I go through a process which is like that of first seeing something with the naked eye and then examining it through a microscope. I find that by fixity of attention division and distinctions appear where none at first was visible, just as through a microscope you can see the bacilli in impure water which without the microscope are not discernible. There are many who decry analysis, but it has seemed to me evident, as in the case of the impure water, that analysis gives new knowledge without destroying any of the previously existing knowledge. This applies not only to the structure of physical things, but quite as much to concepts. " Knowledge," for example, as commonly used is a very imprecise term covering a number of different things and a number of stages from certainty to slight probability.

It seems to me that philosophical investigation, as far as I have experience of it, starts from that curious and unsatisfactory state of mind in which one feels complete certainty without being able to say what one is certain of. The process that results from prolonged attention is just like that of watching an object approaching through a thick fog : at first it is only a vague darkness, but as it approaches articulations appear and one discovers that it is a man or a woman, or a horse or a cow or what not. It seems to me that those who object to analysis would wish us to be content with the initial dark blur. Belief in the above process is my strongest and most unshakable prejudice as regards the methods of philosophical investigation.[1]

The similarity between this passage and the *Prooemium* of the *Physics* is evident. However, although it is evident, it should not surprise us. For as Aristotle says, this method of proceeding from the confused to the distinct is ' natural ' to us. Perhaps, it is precisely because it is ' natural ' to us, that for Russell it is the most important and unshakable of philosophic prejudices.

It should be noted that Russell not only tells us that the process is from the vague to the distinct but that the certainty with which one begins is not destroyed by subsequent discovery. This is a very important point which we shall discuss more at length in another article.

The general notions with which Aristotle begins his study of nature are certain. Later discoveries do not destroy them. The truth of what is proposed in the *Physics*, is in no way compromised by errors which may arise in the steps in concretion nor by the new truths which may be found in these steps. The certainty of general knowledge in no way depends on what further investigation reveals. This, I think, is a very important principle to be remembered when one is discussing the relationship between the traditional philosophy of

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1. Bertrand Russell, " My Philosophical Development," in *Encounter*, February, 1959, Vol.XII, n.2, p.25.

nature and modern science, and it is a principle to which I think Russell would adhere.

It is interesting to note, too, that just as Aristotle concludes his *Prooemium* with three signs which manifest the general principles, Russell concludes his comment on this the sixth of his philosophical prejudices with the example of somebody coming out of a fog. Had Aristotle been familiar with the London fog, he probably would have used the same example.[1]

CONCLUSION

In the *Prooemium* to the *Physics*, Aristotle tells us that it is *natural* for us to proceed from that which is more known to us toward that which is more knowable in itself. He then points out that that which is more known to us, is a confused whole, a universal and that we proceed from this to that which is distinct, the particular. By way of conclusion to this article we shall make some remarks not on the process itself but on the fact that it is *natural*.

If it is natural for the human mind to proceed from the general and confused, any departure from this procedure will be unnatural. Further, this unnatural procedure will come at a time when it can have very grave consequences for it comes at the beginning, at the starting point. As Aristotle points out in the *De Coelo et Mundo*, a small error in the beginning is multiplied ten thousand times as the process continues. " Since the least initial deviation from the truth is multiplied later a thousandfold." [2] The reason for this is that " a principle is great rather in power than in extent ; hence that which was small at the start turns out a giant at the end." [3] St. Thomas in his commentary on this passage compares the principle to the seed which grows into a tree.[4] Small error at the starting point can involve great error at the end.

The starting point for human knowledge is the universal in predication. It is not the universal cause nor is it the universal in representation. This is due to the fact that knowledge has the senses as its abiding principle. Since, however, the most perfect form of human knowledge is the scientific demonstration and since demonstration involves a resolution into first principles, there is always the temp-

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1. *Signum*, as well as *exemplum*, is a type of argument. The difference between these and their respective values, is a rather subtle one. We shall have occasion to return to these subject elsewhere.

2. *De Coelo et Mundo*, I, chap.5, 271 b 9.

3. *Ibid.*

4. " Et hujus causa est, quia principium, etsi sit modicum magnitudine, est tamen magnum virtute, sicut ex modico semine producitur magna arbor : et inde est quod illud quod est modicum in principio, in fine multiplicatur, quia pertingit ad totum id ad quod se extendit virtus principii, sive hoc sit verum sive falsum." ST. THOMAS, *In I De Coelo et Mundo*, lect.9, n.97.

tation for the human mind to seek as its starting point a universal cause. In the *De Veritate*, St. Thomas points out that prophetic knowledge cannot be a *habitus* in the strict sense because it cannot be resolved into first principles. The object of prophetic knowledge is the future contingent which can only be resolved in the essence of God. Since the prophet cannot make this resolution, his knowledge is not a *habitus*. As long as human knowledge is not resolved into its principles, the knowledge is not confirmed in one, consequently there rests but probability. " Quamdiu enim non fit resolutio cognitorum in sua principia, cognitio non *firmatur in uno*, sed apprehendit ea quae cognoscit secundum probabilitatem quamdam utpote ab aliis dicta."[1] The words ' *firmatur in uno* ' in this text correspond to the ' ἐπίστασθαι ' of the first sentence of the *Physics*. " The terms ' knowing ' and ' understanding ' imply that the intellect has reached a state of rest and come to a standstill." [2] The resolution of mathematics is in the imagination. The resolution of natural science is in the senses and that of metaphysics is in the intellect. The ultimate resolution of all science is in the principles of being, consequently mathematics and natural science await for their ultimate resolution in metaphysics. It is metaphysics which orders all. " *Nam sapientis est alios ordinare.*"[3] And it is metaphysics which is the ultimate judge. Judgment is imperfect till it has been resolved in the ultimate principles.

Est autem considerandum quod in omni judicio ultima sententia pertinet ad supremum judicatorium ; sicut videmus in speculativis quod ultima sententia de aliqua propositione datur per resolutionem ad prima principia. Quandiu enim remanet aliquod principium altius, adhuc per ipsum potest examinari id de quo quaeritur ; unde adhuc est suspensum judicium, quasi nondum data finali sententia.[4]

It would be a mistake to think that since the ultimate resolution is in metaphysics, human science should begin with it. The unity of sciences will be found in metaphysics but before arriving at metaphysics, the human mind because of its extrinsic dependance on matter must be satisfied with an inferior unity, the unity of the universal in predication. Beginning with this unity which comes by an abstraction from the given of sensation, the human intellect proceeds by way of concretion toward more distinct knowledge of the sensible world. It then proceeds by way of demonstration of the fact (*demonstratio quia*) toward the separated substances and an analysis of being as such. It is here that the final resolution takes place. But this is not the starting point.

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1. St. Thomas, *De Veritate*, q.12, a.1.
2. *Physics*, VII, chap.3, 247 b 10.
3. St. Thomas, *In I Metaphysicorum, Prooemium*.
4. *Ia IIae*, q.74, a.6.

And if the starting point is not the universal causes neither is it a detailed knowledge of sensible substance. Detailed knowledge as detailed is but fragmentary and is unintelligible except in terms of broader categories. The broader categories are not the universal causes but rather the general notions of the *Physics* with which Aristotle begins his natural science and for that matter all of his science in so far as logic is not considered as science but rather the instrument of science.

In a further article we shall continue the discussion of the order to be followed in natural science by pointing out both the certitude and importance of general and confused knowledge.

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