

THE ARISTOTELIAN CONCEPT  
OF  
NATURAL PHILOSOPHY

(A Commentary on II Physics, 192 b8 - 194 a11)

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by  
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OF

NATURAL PHILOSOPHY

PROPOSITIONS

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1. Logica dividitur in materialem et formalem.
2. Tria sunt principia entis mobilis inquantum huiusmodi, scilicet, forma, materia, et privatio.
3. Potentiae animae specificantur ab actibus et objectis, ad quae essentialiter ordinantur; ab actibus immediate, ab objectis mediate.
4. Felicitas est operatio propria hominis secundum virtutem in vita perfecta.
5. Motus est actus entis in potentia inquantum in potentia.

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## Chapter I

### A Problem of Relationship

#### (The Twofold Investigation of Ens Mobile)

Though the problem which confronts us is that of the Aristotelian method of investigation of nature, it is important that we first consider a preliminary question: What is the relationship between the first and second books of the *Physics*? A first glance at this question of relationship appears to have little or no influence on that of the Aristotelian method of investigation of nature, since the method finds its complete development in the second book. But upon closer examination of the two books we do become aware of a problem. The development of a method entails the problem of adaptation, that is, the problem of adequating the general rules of philosophic procedure, which are found in the logical treatises of Aristotle, (1) to the exigencies of the subject to be investigated. Aristotle himself gives us the reason for this procedure when in the *Metaphysics* (2) he shows why the absolutely best method of procedure cannot be used in every philosophic science and then explains how to find the best method of

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1. The treatises which contain the laws on philosophic procedure are the two books of the *Posterior Analytics*.

2. *Metaphysics* A, c 111, 995a15-20.

investigation for a particular science. Hence in every treatise devoted to the working out of method there will be found an investigation of the subject of the science, which is ordered to the solution of the problem of adaptation. It is here that we come face to face with our difficulty. In the first book we find an extensive search for the intrinsic principles of ens mobile, while in the second we again come into contact with another investigation of ens mobile. Yet granting that the formalities under which this twofold investigation is carried on, are different (the first examines ens mobile under the aspect of its intrinsic constitutive principles, the second under the aspect of nature (3) there still remains the question : Why this double investigation ? Are they both necessary in the sense that they represent a connected effort to discover the proper procedure for the science of nature ? or are they so unrelated that it is possible to study the treatise on method by concentrating on the second investigation of ens mobile to the exclusion of the first as something extraneous ?

This problem of the double investigation touches directly the question of its origin, for, as we have mentioned, the derivation of a method of investigation demands as its first step, the examination of the requirements of the subject. Indirectly, however, but in a very vital manner it influences the method itself. This

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5. The distinction between the two formalities will be discussed in chapter III.

indirect but vital influence consists in the baneful effects which ignorance of the method's origin causes in the one who uses it. This becomes clearer when we consider what method is. In our discussion of this point we will confine ourselves to the role of method in the field of nature.

What is the method of investigation proper to the science of nature ? It is a scientifically constructed instrument by which the mind is aided in the acquisition of the truth of natural things. Fashioned in accordance with rigidly established rules for demonstrative procedure and adapted to the demands of the subject-matter, nature, it is the mind's indispensable guide through the maze of difficulties that are encountered in the quest after the truth of natural things. The absolute necessity for this guide can better and more easily be appreciated if we take into account the difficulties that are to be met with. These have a twofold characteristic. First, they are dangerous, for oftentimes they can turn the mind from truth to error and there is sufficient evidence to prove that in many instances they have done just that. (4) Secondly, these difficulties are inevitable. It is impossible to enter deeply into the study of natural things with-

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4. A study of the first book of the *Physics*, to mention only one of many possible examples, will acquaint the student with many of the errors into which Aristotle's predecessors fell because of their inability to cope with difficulties.



out coming into contact with difficulties, for they spring from the things themselves under investigation and from the investigator himself. (5) Such things as matter, motion, time, offer difficulty because these are not very intelligible in themselves. (6) When we realise that these figure prominently in the science of nature, we are better able to perceive the difficulties that are part of the study of natural things. On the other hand the difficulties which spring from the investigator himself, are due to the very nature of his intellectual faculty. Man occupies the lowest grade in the

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5. "Ostendit causas praemissas difficultatis. Ubi similiter considerandum est, quod in omnibus, quae consistunt in quadam habitudine unius ad alterum, potest impedimentum dupliciter vel ex uno vel ex alio accidere: sicut si lignum non comburatur, hoc contingit vel quia ignis est debilis, vel quia lignum non est bene combustibile; et similiter oculus impeditur a visione alicuius visibilis, aut quia est debilis aut quia visibile est tenebrosus. Sic igitur potest contingere quod veritas sit difficilis ad cognoscendum, vel propter defectum qui est in ipsis rebus, vel propter defectum qui est in intellectu nostro." St Thomas, II Meta., lect. 1, n. 279.

6. Prime matter, because it is pure potentiality, cannot be known directly but must be approached through form to which it is ordered. So too with motion and time. Though not pure potency, motion does not possess a high degree of intelligibility, because it is essentially a mixture of potency and act and hence its investigation is made difficult by the indeterminateness of the object. With regard to time as an object, it was St Augustine who said: "What, then, is time? If no one ask of me, I know; if I wish to explain to him who asks, I know not." (St Augustine, Confessions, Bk. XI, c xiv.

hierarchy of intellective substances (7), possesses the least power in the intellectual order. His intellect is pure potency in the order of the intelligible, just as prime matter is pure potency in the order of the sensible. (8) This totally potential condition of his intellect makes necessary a multitude of acts in order that he achieve perfection in knowledge, for "in as far as some power is higher, in so far is it found to operate from fewer (principles) which nonetheless extend to many." (9) The fact that the human intellect is pure potency definitely increases the number of acts needed to perfect it, for the act that is first proportionate to the intellect is an imperfect act, i.e. an act which contains a certain amount of indeterminacy, of confusion. This is because the natural process of so potential a thing as the intellect is to go to the perfect through the imperfect (10), for an act

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7. "Sic igitur, cum anima humana sit ultima in ordine substantiarum intellectivarum, minime participat de virtute intellectiva." St Thomas, II Meta., lect. 1, n. 885.
  8. "Intellectus humanus autem se habet in genere rerum intelligibilium ut ens in potentia tantum, sicut et materia prima se habet in genere rerum sensibilium; unde possibilis nominatur." Summa Theologiae, I P., Q. 87, a. 1, c.
  9. "Et quia efficacia rei in operando est ex hoc quod est in actu, inde est quod omnis virtus quanto magis unita est, tanto est efficacior ad operandum; et ideo quanto aliqua virtus altior est, tanto invenitur ex paucioribus operari, quae tamen ad plura se extendunt." St Thomas, De Veritate, Q. VIII, a. 10.
  10. "Secundo oportet considerare quod intellectus noster de potentia in actum procedit. Omne autem quod procedit de potentia in actum, prius pervenit ad actum incompletum qui est medium inter potentiam et actum quam ad actum perfectum." Summa Theologiae, I P., Q. 88, a. 3, c.

is received not according to the mode of the act but according to the mode of the recipient. No matter how perfectly actual an object may be in itself, the intellect, being pure potency, can obtain in the beginning only a confused notion of that object, for it is only when the object is indistinct that it is proportionate to the intellect. Progress towards dispelling the confusion is made through the medium of other acts, for, once being determined, the intellect is capable of receiving more distinct acts. This is what Aristotle means when he says : "Now what is to us plain and obvious at first is rather confused masses, the elements and principles of which become known to us by analysis." (11) This procedure of going from the confused and indistinct to the clear and distinct, involving as it does a multiplication of media, is certainly a fertile field for difficulties for the intellect. In order that it might arrive at a perfect knowledge of the object, the intellect must not only consider the various aspects of the object (and this necessitates a multiplicity of concepts) but must also reduce this multiplicity to a unity, since the intellect is

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11. I Physics, c 1, 184a22-23 (Ross Edition).

incapable of considering simultaneously an actual multiple. (12) Such a thing as knowing the multiple in its multiplicity is not possible, since it means that the intellect would understand at the same time many forms of the same genus. The fact that these multiple forms may not be opposed, does not alter the situation. (13) If, therefore, the intellect, reducing the multiplicity of aspects to a unity, should omit one or invert the order, the result is error. Aristotle in his Posterior Analytics (14) shows his awareness of this danger, when in discussing

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12. "Respondeo dicendum quod intellectus quidem potest multa intelligere per modum unius, non autem per modum multorum : dico autem per modum unius vel multorum, per unam speciem vel plures species intelligibiles. Nam modus cuiusque actionis sequitur formam quae est actionis principium. Quaecumque ergo intellectus potest intelligere sub una specie, simul intelligere potest : et inde est quod Deus omnia simul videt, quia omnia videt per unum quod est essentia sua. Quaecumque vero intellectus per diversas species intelligit, non simul intelligit. Et huius ratio est quia impossibile est idem subjectum perfici simul pluribus formis unius generis et diversarum specierum : sicut impossibile est idem corpus secundum idem simul colorari diversis coloribus, vel figurari diversis figuris. Omnes autem species intelligibiles sunt unius generis, quia sunt perfectiones unius intellectivae potentiae, licet res quarum sunt species sint diversorum generum. Impossibile est ergo quod idem intellectus simul perficiatur diversis speciebus intelligibilibus, ad intelligendum diversa in actu." Summa Theologiae, I P., Q. 85, a. 4.
13. "Dicendum quod non solum oppositae formae non possunt esse in eodem subjecto, sed nec quaecumque formae eiusdem generis, licet non sint oppositae; sicut patet per inductum exemplum de coloribus et figuris." ibid., ad 2um.
14. "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." I Physics, c 1, 184a12-14.

the manner of discovering a definition through the medium of division, he points out two things that must be avoided, the inversion of the order among the various predicates and the omission of any predicate essential to the definition.

Now the method of investigation proper to the study of nature is a scientifically constructed instrument by which reason is guided more critically through these difficulties. But in order that the method afford this guidance to reason, it is necessary that reason control it. A paradox is to be found here, Method guides reason, reason controls the method-for since it is a question of an intellectual instrument, it can only be attained through an understanding of the method. This understanding of method is not any type of understanding but a complete mental grasp. (14) Having attained this understanding of the method reason will be habitually armed against the pitfalls occasioned by its own weakness or by the obscurity of the object. For the investigator, possessed of such knowledge, method becomes second nature. To know the Aristotelian method of investigation in the field of nature in this manner is not possible unless we examine the method in its origin. For this method, like all method, is an adaptation of the general science of method to the peculiarities

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14. "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." I Physics, c 1, 184a18-14.

of the object under consideration, whose fitness can only be judged by an examination of the object to which it is to be adapted. The failure to do this, leaves in obscurity the question of the foundation without which, though the structure of the method be perfectly and soundly logical, the method must become a 'dons ex machina', a pure a priori fabrication.

Perhaps the importance of a knowledge of the foundation of a method can best be shown by considering the case of logic. Logic is the science of the method of correct thinking. It is a tightly knit structure of laws governing the acts of reasoning. It proposes rules by which the mind can proceed, without fear of error, to investigate any type of object. The structure, as manifested to us in the *Organon*, is indeed a master-piece of human reasoning. Despite the fact that it is a triumph of the mind, the entire edifice suffers with regard to its primary end (to aid the mind in its pursuit of truth) unless it be shown that it has its roots in reality, that it is not a pure a priori fabrication superimposed on the mind without regard for the real needs of that faculty. As long as its foundation remains shadowy, the science of logic is viewed with suspicion and the suspicious mind does not control it. Just as a knowledge of the foundation of its method is important for the use of logic, so too an understanding of the foundation of the method to be employed in investigating nature is necessary to insure its profitable use. To

ignore the problem caused by the double investigation of the subject of the science of nature will result in an obscurity that will affect its use, since the unsolved question will generate a suspicion in the mind of the investigator. He will be uncertain, for there will always be present to him an unknown factor connected with the method of investigation.

Two Possible Solutions to the Problem of the Double Investigation.

A) The autonomous character of books i and ii.

W.D. Ross in his commentary on book ii of the *Physics* (15) offers the following solution to the problem of the twofold examination of the subject of the science of nature :

"In book i Aristotle began the study of *φυσικὴ* with the conception of *ἀρχαί* and the main result of the book was the establishment of three distinct *ἀρχαί*, *ὑλὴ*, *νόησις*, *ἐνδεές*. In book ii he makes a fresh start by studying the conception of *φύσις* itself. There is no organic connexion between the two books; they are independent approaches to the whole subject. Their independence is indicated not only by the absence of close connexion in thought, but by the absence of a connecting particle, which is evidence, so far as it goes, that book ii was originally a separate essay. (cf. Introduction)" (16)

In the 'Introduction' to which he refers in the above citation, Ross states:

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(15) W.D. Ross, *Aristotle's Physics. A Revised Text with Introduction and Commentary.*

(16) *Ibid.*, p. 499.

"The beginning of book ii presents the appearance of  
 "being the beginning of a separate work. It makes no  
 "reference to the results of book i but starts straight  
 "off with an analysis of the notion of In most  
 "of the MSS and in the lemmata of Philiponus and Simplicius  
 "it begins without a connecting particle, which is  
 "an unusual feature in Aristotle's works, and one that  
 "points to a relative independence. Yet we have seen  
 "that the Metaphysics several times refers to book i  
 "as part of and though it seems to have been  
 "originally a separate essay an attempt  
 "was later made (quite possibly by Aristotle himself)  
 "to link it up with the three following books. The  
 "evidence of this patchwork is seen in the best MS., B,  
 "where at the end of book i, after the words  
 "we have  
 "and then at the beginning  
 "of book ii (as in the other MSS.)  
 "I conjecture that  
 "here the abrupt particle-less beginning of book ii is  
 "its original beginning, and that  
 "and B's in represent a later at-  
 "tempt to produce at any rate an external connexion (for  
 "there is no organic connexion) between the two books." (17)

Rees' solution of the problem, as is evident from the  
 two quotations, is that books i and ii are not organically connected;  
 that the two investigations into the subject of the science of nature  
 are unrelated: "There is no organic connexion between the two books;  
 they are independent approaches to the whole subject." (18) In proof  
 of his position he notes "the absence of close connexion in the thought"  
 (19) as well as "the absence of a connecting particle." (20)

17. *ibid.*, p. 5.

18. *ibid.*, p. 499.

19. *ibid.*, p. 499.

20. *ibid.*



B) A unified introduction to the science of nature.

In his 'Introduction a la Physique Aristotelicienne' Auguste Mansion likewise treats the question of the relation of books I and II. In the third chapter of this work, after having first noted the rather strange arrangement of the matter, namely the priority given the discussion of the principles over that of determining the object of Physics (21), Mansion shows the reason why Aristotle proceeded in this manner by pointing out the relation of the first book to the concept of nature.

"Despite that, one must recognize that the initial  
"book of the work is well placed; it does nothing  
"less than assure to Natural Philosophy the com-  
"pleteness of its object. Such is at least the con-  
"cept that Aristotle had of it: from the beginning  
"the ancient naturalists had taken a false road in  
"their explanations of the world, but above all the  
"audacious speculations of the Eleatic School has  
"accentuated their unfortunate tendency; even though  
"it be Empedocles, Democritus or Anaxagoras, all  
"the subsequent theorists were affected, to a great-  
"er or less degree, by the arguments by means of which  
"the Eleatics proved the unity and immobility of being;  
"without subscribing to this thesis in its most  
"absolute sense, they all attempted to explain cosmic  
"becoming, by reducing it to change of modalities, of  
"positions and appearances, while the substantial  
"substrate of things remained unchanged. But we are  
"going to see that the presence of becoming is for  
"Aristotle absolutely basic to his conception of nature  
"and that he wishes to defend its reality in the

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21. "On peut s'étonner pourtant de le voir traiter avant l'objet même  
"de la physique, - la nature - car ce n'est qu'au livre II, que  
"la définition en est établie, et qu'on apprend de quelle façon  
"précise le physicien doit l'étudier." Chpt. III, p. 55 (2ième  
Edition).

"substantial order as well as in the accidental  
"changes of things. It is to that that the dis-  
"sertation on principles is devoted." (22)

Again in his resume of this same chapter he touches  
the problem of the relation of the two books. Here, however, he ex-  
pressly mentions the order that book I has to book II.

"The first book of the *Physics* terminates with several  
"lines where the study of the form is postponed until  
"later: this study will be found either in *metaphysics*,  
"or, with regard to the forms of the natural things, in  
"the subsequent expositions of the present series of lessons."

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22. Op. Cit., Chpt. III, p. 53-54: "Malgré cela on doit reconnaître que  
"le livre initial de l'ouvrage est bien à sa place; il ne va à  
"rien moins qu'à assurer l'intégralité de son objet à la philoso-  
"phie physique. Telle est du moins la conception que s'en fait  
"Aristote : dès l'origine les anciens physiologues avaient fait  
"fausses route dans leurs explications du monde, mais surtout  
"les audacieuses spéculations de l'Ecole d'Elée avaient accen-  
"tué leur fâcheuse tendance; qu'ils s'appelaient Empédocle, Dé-  
"mocrite ou Anaxagore, tous les théoriciens postérieurs avaient  
"été touchés, dans une mesure plus ou moins grande, par les ar-  
"guments au moyen desquels les Eléates prouvaient l'unité et  
"l'immobilité de l'être; sans souscrire à cette thèse prise dans  
"son sens le plus absolu, ils avaient tous essayé de rendre  
"compte du devenir cosmique, en le réduisant à des changements  
"de modalités, de positions et d'apparence, tandis que le fond  
"substantiel des choses restait inchangé. Or nous allons voir  
"que la présence du devenir est pour Aristote absolument primer-  
"diale dans sa conception de la nature, et qu'il veut en sou-  
"tenir la réalité aussi bien dans l'ordre de la substance que  
"dans les changements accidentels des choses. C'est à cela  
"qu'est consacrée sa dissertation sur les principes."

"This colorless conclusion does not make one suspect the  
"general result which Aristotle had envisioned in placing  
"this discussion on the principles at the beginning of  
"his treatises of natural philosophy. In reality, we  
"have seen, he has shown the possibility of a true be-  
"coming in natural bodies: for him this thesis conditions  
"essentially the possibility of a special philosophy of  
"the external world phenomena; as soon as one rejects it,  
"there is no longer a medium between the science of the  
"absolute or metaphysics and the purely mechanistic ex-  
"planation of phenomena, physics becomes the knowledge  
"of the displacement of elements or minute bodies which  
"gives us the illusion of becoming. It is only after  
"having shown that his object does not reduce itself  
"solely to that, but that he can attain more profoundly  
"corporeal being and its roots, that Aristotle finds him-  
"self in a position to examine fruitfully what in a  
"precise manner is this object. This study begins in  
"the second book of the Physics; a priori one would have  
"expected to find it at the beginning of the entire work;  
"but historic circumstances have forced the Stagirite to  
"make a 'new beginning' in order to approach it further  
"on." (23)

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23. Op. cit., chyt. iii, p. 79: "Le premier livre de la Physique se  
"termine par quelques lignes où l'étude de la forme est renvoyée  
"à plus tard: cette étude trouvera sa place soit en métaphysique,  
"soit pour les formes des êtres de la nature, dans des exposés  
"ultérieurs de la présente série de leçons.  
"Cette conclusion insolore ne fait pas soupçonner le résultat  
"général qu'a visé Aristote en mettant cette discussion sur les  
"principes en tête de ses traités de philosophie naturelle. En  
"réalité, on l'a vu, il a montré la possibilité d'un devenir vé-  
"ritable dans les corps de la nature; pour lui cette thèse con-  
"ditionne essentiellement la possibilité d'une philosophie spéci-  
"ale du monde phénoménal externe; dès qu'on la rejette, il n'y a  
"plus de milieu entre la science de l'absolu ou la métaphysique  
"et l'explication purement mécanique des phénomènes, la physique  
"devient la connaissance des déplacements d'éléments ou de cor-  
"puscules qui nous donnent l'illusion du devenir. Ce n'est donc  
"qu'après avoir montré que son objet ne se réduit pas uniquement  
"à cela, mais peut comporter une explication plus profonde de  
"l'être corporel et de ses origines, qu'Aristote se trouvera en  
"mesure d'examiner avec fruit quel est d'une manière précise cet  
"objet. Cette étude commence au livre II de la Physique; a priori  
"on se serait attendu à la trouver en tête de tout le traité;  
"mais les circonstances historiques ont forcé le Stagirite à fai-  
"re 'un nouveau début' pour l'aborder plus loin."

While Mansion sees in this first book a whole whose meaning we can seek without having to refer directly to the rest of the work (24), he does not visualize book II as totally independent of book I. According to him the extended investigation that is conducted in the first book, deals with a problem of the greatest consequence, that of the principles of the subject. (25) The success which crowned this investigation, permitted Aristotle to advance to the second investigation, that of determining in a more precise manner the subject of the science. This second investigation is contingent upon the first and not in any mere accidental fashion. (26) Were it not for the possibility of a true becoming in nature, which Aristotle establishes through the first inquiry, there would be no reason for the search after the principles of the science of nature, to which the second examination of the subject is immediately ordered, since there would be no such subject. In that case, instead of the science of nature which we now possess, Physics would be nothing more than the

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24. *ibid*, p. 55-56: "Ce livre forme donc un tout, dont nous pouvons chercher à déterminer la signification sans avoir à nous référer nécessairement pour cela à la suite du traité."

25. *ibid*, p. 79 : "pour lui cette thèse (la possibilité d'un devenir véritable dans les corps de la nature) conditionne essentiellement la possibilité d'une philosophie spéciale de monde phénoménal externe."

26. *ibid*, p. 79: "dès qu'on la rejette, il n'y a plus de milieu entre la science de l'absolu ou métaphysique et l'explication purement mécanique des phénomènes."

knowledge of the displacement of elements or minute bodies, which give us the illusion of becoming." (27) For Mansion, then, there does exist a very close connection between book i and ii. So closely are they connected that book ii finds its justification in the first. Far from being independent approaches to the whole subject, as Ross considers them (28), they constitute for Mansion a unified introduction to the science of natural things.

#### An Evaluation of the Two Solutions.

We now have two solutions to the problem of the double examination of the subject of natural science. Ross by holding that the two books are totally independent of each other, denies any connection between the two investigations which the subject of the science undergoes. This being so, it appears that we are warranted in concluding that for Ross it is possible to study the treatise on method by beginning with the second of the two investigations of ens mobile. Mansion, on the contrary, holding as he does, (for a) close dependence of book ii on book i, seems to take the position that the problem of methodology involves the twofold investigation of ens mobile. Since these are opposing positions, it will be necessary to submit both of them to a closer scrutiny in order to determine which of the two of-

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27. *ibid*, p. 79: "la connaissance des déplacements d'éléments ou corpuscules qui nous donnent l'illusion du devenir."

28. *cfr* section A(.

ferr the proper solution.

A) Ross' Solution.

As we have indicated (29)<sup>x</sup>, Ross bases his position on two arguments. The two books are independent approaches to the whole subject, have no organic unity. This is proven "not only by the absence of close connexion in the thought, but by the absence of a connecting particle, which is evidence, so far as it goes, that book ii was originally a separate essay." (30) Leaving aside for the moment the charge that there is no close connection in the thought of the two books, let us examine the argument from the absence of a connecting particle.

The argument from the lack of a verbal connection is used by Ross as one of the proofs for the independence which, in his opinion, exists between the two books. To evaluate it properly, we must examine the argument in the light of the conclusion in proof of which it is adduced. Does the conclusion, namely there is no organic unity between books i and ii, flow from the premise that there is no connecting particle? It seems that Ross considers this premise as

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29. see pp. 10-11.

30. Ross, op. cit., p. 499.

directly proving the separate origin of the two works (81) and indirectly, through their separate origin, the independence of the two. His own words indicate that such is his thought for he says : "Their independence is indicated not only .... but by the absence of a connecting particle,". I think that we can grant that the books were composed at different times but I question that this difference in time can be used to establish conclusively their independence. The fact that the two were composed at different times, would not make impossible organic unity. It is well within the realm of possibility that, even though the treatise on the principles of natural being was originally a separate essay (82), it could still serve as a base upon which Aristotle could build further. Such a hypothesis would guarantee the independence of the book in its origin and yet allow for an organic unity between it and that treatise which has its foundation in it. What is involved in the question is independence versus dependence and it is not contradictory to predicate independence of one treatise and dependence on that one by another. Should such a relation of independence-dependence exist between books i and ii in the sense that book ii is dependent on book i, this latter, however, being independent, then the position which maintains their mutual independence, would be false. The final and definitive judgement of the hypothesis, however, requires

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81. See citation (30) in the text.

82. By separate we mean independent in the sense of being a totality whose complete meaning is to be found within itself.

an investigation of the thought-content of the books in question. This will be done on a subsequent page. At this point we can state that Ross' medium, the fact that book i was originally a separate essay, decidedly does not destroy the hypothesis and hence is inconclusive.

Ross resorts to a much more potent medium to prove his contention about the independence of books i and ii when he claims that there is an absence of close connection in the thought content of the books. If this charge be substantiated, one must then accept Ross' conclusion. Because we will have another opportunity, on the occasion of submitting Mansion's opinion to examination, to test the evidence of the text itself, we will content ourselves here with investigating this charge in the light of Aristotle's own concept of the disputed books.

What was Aristotle's concept of books i and ii ? Did he consider their matter as one or as distinct ? The following points, we believe, will furnish us with an answer to these questions.

Point I The attempt to supply a connecting particle.

Ross admits that there is evidence which goes to prove that an attempt was made to make up for the lack of a verbal connection by the insertion of a connecting particle. Speaking of this he says:

"and though it seems to have been originally a separate treatise *περὶ ἀρχῶν* an attempt was later



"made (quite possibly by Aristotle himself) to link  
 "it up with the three following books. The evidence  
 "of this patchwork is seen in the best MS., E, where  
 "at the end of book I, after the words  
 "... we have  
 and then at the begin-  
 "ning of book II (as in the other MSS.)  
 (83)

This attempt to supply for the original deficiency by the insertion  
 of a connecting particle, made, as Ross admits, "quite possibly by  
 Aristotle himself", makes quite acceptable the conclusion that the  
 Stagirite conceived the books as connected in their thought content.  
 Otherwise the attempt to join them verbally is inexplicable. We think  
 that the following point will make this conclusion even more acceptable.

Point II A common title.

In the *Metaphysics* we find many references to the first  
 and second books of the *Physics* (34), and a very striking feature with  
 regard to these is the fact that Aristotle speaks of both books under  
 a common title. Sometimes the books are referred to as the 'Physics'  
 (*τὰ Φυσικά*) (35), sometimes as 'Nature' (*τὰ περὶ φύσεως*) (36). This fact

83. Op. cit., p. 5.

34. I *Physics*: (Meta., 986b30; 1062b31; 1076a9; 1086a23).  
 II *Physics*: (Meta., 983a33; 985a12; 988a22; 993a11; 1059a34)

35. Meta., 1062b31 (I *Phys.*, 7-9); Meta., 1076a9 (I *Phys.*, 1); Meta., 993a11  
 (II *Phys.*, 3, 7); Meta., 1059a34 (II *Phys.*, 5)

36. Meta., 986b30 (I *Phys.*, 5); Meta., 1086a23 (I *Phys.*, 4-6); Meta.,  
 983a33 (II *Phys.*, 3, 7); Meta., 985a12 (II *Phys.*, 3, 7); Meta.,  
 988a22 (II *Phys.*, 3, 7).

indicates that in his mind there was a sufficient community between the two to justify a common denominator. Ross recognizes this, for it because of this common title used by Aristotle in the *Metaphysics* that Ross admits that the attempt which was later made to connect the two books, was made "quite possibly by Aristotle himself." (57) The method of reference found in the *metaphysics* considerably strengthens then, the probability of the Aristotelian authorship of the inserted connecting particle and makes the conclusion drawn from it more probable.

Again we find in the *De Caelo* (38) other indications of Aristotle's concept of the disputed books. In this treatise Aristotle, discussing the various ways of proving that there is not an infinite body, makes a reference to the kind of proof he had advanced in "our discussion of principles." (39) He is here referring to *Physics* III, chapter 4-8, using a title more properly belonging to book I. With regard to this reference Ross states :

"If we treat book I as the treatise *περὶ ἀρχῶν*  
"par excellence, we must at the same time recognize

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37. "Yet we have seen that the *Metaphysics* several times refers "to book I as part of and though it seems to have "been originally a separate essay an attempt was "later made (quite possibly by Aristotle himself) to link it "up with the three following books." *op. cit.*, p. 5.

38. I *De Caelo*, 274a21.

39. "But it may also be shown universally, not only by such reasoning as we have advanced in our discussion of principles."

"that this phrase had a wider application; for the  
"only actual reference in Aristotle under this  
"title (in *De Caelo* 274a21) is to *III Physics*. We  
"must suppose that the treatise formed by uniting  
"the one book *περί κινήων* with the three *περί φύσεως*  
"could be referred to by either title, though the  
"latter greatly predominates; Simplicius bears  
"witness to the double nomenclature." (40)

On Ross' own admission, then, there is for Aristotle a unity existing  
between the first four books of the *Physics*, which enabled him to  
designate them by a common title.

What effect do these considerations have upon Ross'  
denial of a thought connection between books I and II? The at-  
tempted verbal connection and the method of reference used in the  
*Metaphysics* certainly seem to point to an opposition between Aristotle's  
concept of the work and that of Ross. The only possible explanation  
of the two is that there must have been in Aristotle's mind a closer  
connection between the matter of the two books than that acknowledge  
by Ross. Were the two independent approaches to the same subject with  
no other bond of unity between them than that of a common 'subjectum  
materiale', there would be no justification for a verbal connection or  
a common title, since both of these are indicative of a unity of thought.  
The fact, then, that Aristotle did seek, very probably, to join the two  
books verbally and on occasion referred to them under a common title,

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40. *Op. cit.*, p. 5-6.

shows that more was involved in his concept than is contained in Ross' opinion of the books. Without attempting to determine definitely the opposition between the concepts of the two (this entails the examination of the text), but with the knowledge that there does exist an opposition, we can place the following conclusion. Since Ross' position shows a definite opposition to Aristotle's concept, it is very probable that the former is incorrect in his contention that there is no close connection in the thought of the books, and his principal conclusion, which rests on this contention, is likewise very probably false. Any other conclusion would expose us to the necessity of maintaining the highly improbable position that Aristotle misunderstood his own work. This is the consequent of sustaining Ross' position in opposition to Aristotle's. The place occupied by Aristotle in the history of thought does not justify the holding of that alternative without more plausible proof.

B) Mansion's Solution.

Mansion's idea of book ii as essentially depending on the thought of the first book (41) has the merit of being more conformable to the Aristotelian concept, such as we have thus far indicated

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41. cfr. citation in text, p. 13-14.

it, i.e. there is a connection between the thought content of the two books. This conformity, in its details, is conclusively established by an examination of the books from the point of view of the laws governing the procedure of a scientific work as laid down by Aristotle in the Posterior Analytics. According to Aristotle an indispensable preliminary for scientific knowledge is what he terms "pre-existent knowledge." (42) This pre-existent knowledge embraces both the things that must be known as well as the manner of knowing them. The things that must be known are three; the subject, the proper passion of the subject and the principle. (43) The manner in which these three must be known, is described by Aristotle in the following words. "The pre-existent knowledge required is of two kinds. In some cases admission of the fact must be assumed, in others comprehension of the meaning of

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42. "All instruction given or received by way of argument proceeds "from pre-existent knowledge." I Post. Anal., c 1, 71a1.

43. The number of things to be known and the reason for their knowledge is derived from Aristotle's concept of the demonstrative syllogism, the instrument par excellence of scientific knowledge. In a syllogism what is sought is a conclusion in which the proper passion is predicated of its subject and which conclusion is inferred from certain principles. Because the knowledge of the simple is prior to that of the complex, before one can have a knowledge of the conclusion, he must first know in some way not only the subject and the passion but also the principles, for the conclusion becomes known through the principles from which it is inferred. Cfr. S. Thomas, I Post Anal., lect. 2, n. 2.

the term used, and sometimes both assumptions are essential." (44)  
Since Aristotle's intention was to attain a scientific knowledge of nature (45), it was necessary for him to have a pre-existent knowledge of the subject, the passion and the principle.

However, at the very outset he was faced with a problem that tended to destroy the subject of the science of nature. Most of his predecessors denied the fact of true becoming, as can be seen from a perusal of the first part of book 1 of the Physics where Aristotle exposes and refutes their theories. (46) Encountering this denial of the fact of true becoming and feeling that he could not, in the face of existing opinion, assume the fact, Aristotle took the only course that was possible. He plunged into the problem of whether there was such a thing as true becoming. Any other procedure would have been a betrayal of his own doctrine on scientific procedure.

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44. I Post. Anal., c 1, 71a11-13.

45. "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." I Physics, c 1, 184a9-15.

46. I Physics, ch. ii-iv.

His acquaintance with the doctrines of the early naturalists made Aristotle acutely aware of where the problem lay and where the solution was to be found. The difficulty which proved so great an obstacle to the minds of the earlier investigators, had been to find the principles that would explain substantial or true becoming, and because they failed to discover such principles, they denied its possibility. Aristotle, pursuing the same course, succeeded where they failed. He discovered the principles which establish the possibility of true becoming. This he achieved mainly through his concept of 'prime matter', the permanent element in every change, which is, in a certain sense, non-ens. This principle was the key that provided Aristotle with an escape from the difficulty upon which his predecessors foundered, namely that since whatever comes to be, comes to be either from being or non-being, and since it is impossible for it to come from either, there can be no becoming. (47) Having solved this difficulty, and thereby established the possibility of substantial becoming, Aristotle was now, and only now, prepared to advance to the problem of adapting the laws of scientific procedure to his subject, becoming itself. This new problem, which constitutes the matter of book

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47. "So they say that none of the things that are either comes to be or passes out of existence, because what comes to be must do so either from what is or from what is not, both of which are impossible. For what is cannot come to be (because it is already), and from what is not nothing could come to be (because something must be present as a substratum)." I Physics, e viii, 191a26-32.

ii, definitely owes its existence to the solution of the prior problem, the existence of true becoming.

The foregoing analysis of book i, bringing out, as it does, the order that exists between books i and ii, is more than sufficiently decisive to prove the correctness of Mansion's solution. His contention that the second book depends essentially on book i, is in complete harmony with the conclusion arrived at through our examination of the thought content of the first book. This investigation, carried on in accord with Aristotle's rules for scientific procedure, corroborates Mansion's position, for it shows that, due to his success in solving the problem which caused others to fail, Aristotle was able to advance to the question of method appropriate to such a subject. Had he, like those before him, also failed to overcome the difficulty, there would have been no problem of a method proper to the subject of becoming.

The analysis also proves how incorrect Ross is in maintaining the independence of books i and ii. His position springs from an overemphasis of the original character of book i and from a failure to make use of the criterion furnished by the Stagirite's doctrine on the requisites for scientific knowledge. As a result his position must be rejected, for it contradicts the evidence of the books themselves.



### Conclusion

We are now in possession of the answer to the problem of the twofold investigation of the subject of the science. They are not independent. Between them there exists a very close connection. The first justifies the second, for it establishes the possibility of the subject itself. The second, which looks upon the same subject under a different formality (48) becomes nothing more than a logical foray into the realm of phantasy if unconnected with the first investigation, since in such a case there is no proof that the subjects exists.

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48. What this formality is and why the subject should be examined under this formality, will be considered in the third chapter.

**SECTION I**

**THE ROLE OF CHAPTERS 1-11, II PHYSICS**

## Chapter II

### The Formal Purpose of the Second Book.

A commentary is an expose of another man's work. Unlike the paraphrase, which is nothing more than a literary recasting of a passage or work, the commentary is what St Thomas calls an 'expositio'. (49) It is a critical appraisal of a work and entails an exhaustive examination of the subject matter of the work, otherwise the appraisal is merely superficial. A paraphrase, on the other hand, does not appraise the work which it reproduces in language other than that of the author, nor does it require any great examination of the text. All that is necessary is a sufficient understanding of the thought of the author to make certain that the paraphrase renders faithfully the author's ideas. Now because a commentary is a critical appraisal of a work, the commentator, unlike the translator, is called upon to pass judgement. To accomplish this task of examining and of judging he must, first of all and most importantly, appreciate the author's purpose in writing the book. This knowledge of the author's intention is the soundest medium that the commentator can have for success in the labor which he has undertaken, without it he is un-

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49. "Quia liber Physicorum, cuius expositioni intendimus, ..."  
I Physics, lect. 1, n. 1.

equipped to judge the work in its totality as well as in the parts that constitute the whole. The totality escapes him for only when the commentator knows what the author intended to do, is he in a position to measure the success or the failure that attended the author's efforts. Moreover, to judge the parts of the work demands the interpretation of these parts in the light of the formal intention of the author. To attempt to pass judgement on the adequacy of the parts selected, without the benefit of the knowledge of the end intended by the author, is to make impossible a commentary in the sense in which we have defined it. For in that case the only truly objective criterion, namely the end being the measure of the means, is lost. Since this dissertation is a commentary on the second book of Aristotle's *Physics*, it will be necessary, in the interest of preserving the character of the work, to first seek for that incalculably valuable instrument, the knowledge of Aristotle's purpose in writing the second book.

Actually the problem of determining Aristotle's purpose in writing the second book has been made easy for us, since he himself reveals the answer. In the third chapter of the second book of the *Metaphysics* (80), speaking in general of the effect of method on

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80. *Meta.*, a, c 111, 994b31-995a20.

learning (51) and of the necessity of first acquiring method (52), Aristotle gives an example of the way to solve the problem of finding the proper method for a particular science. The science he uses is that of Nature. In the course of his exposition he presents us with the formal purpose of the second book of the Physics. Since there can be no doubt that in this passage Aristotle is revealing the principal formality of book ii of the Physics, (St Thomas in his commentary on this passage does not hesitate to make this identification, for he says : "And this method he himself observes in the second physics as is evident to one who diligently inquires." (53) it will be useful to reproduce this text and examine it closely.

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51. "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 petty-foggery. For accuracy has something of this character, so that as in trade so in argument some people think it mean." *ibid*, 994b31-995a10.
52. "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 them." *ibid*, 995a18-14.
53. "Et hunc modum ipse observat in secundo Physicorum, ut patet diligenter intuenti." II Metaphysics, lect. 5, n. 337.

"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 see what natural science treats of (and whether it belongs to one science or to more to investigate the causes and principles of things.)."(54)

In this text Aristotle is insisting upon the need of adapting method to subject. But he very decidedly says that the absolutely best method is not suitable to every subject: "The minute accuracy of mathematics is not to be demanded in all cases, but only in the case of things which have no matter." The mathematical method, i.e. demonstration through formal cause (55), is easily the best method since it guarantees such "minute accuracy." Yet it cannot be applied indiscriminately to any subject whatever but is applicable "in the case of things which have no matter", e.e. no sensible matter. (56) The application of this method to the non-mathematical, i.e. to the thing that includes sensible matter as an essential constitutive

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54. Meta., a. 998a15-20.

55. "In scientiis enim mathematicis proceditur per ea tantum quae sunt de essentia rei solius cum demonstrant per causas formales." St Thomas, De Trinitate, Q. V, a. 1, c.

56. The object of mathematics is in the second degree of abstraction i.e. it is abstracted from common sensible matter and not from all matter, since there remains, as a proper condition of its object, intelligible matter. Cfr. St Thomas, I Phys., lect 1, nn. 2, 3; De Trinitate, Q. V, a. 1, c.

element, as well as to the thing that excludes all matter, will not produce that minute accuracy, which is its fruit when applied to mathematical objects. For on the one hand the method, concentrating, as it does, on a form that is intelligible without any order to sensible matter (57), ignores the sensible element so essential to the being and to the understanding of the thing among whose constitutive elements is sensible matter. On the other hand the application of this method to things purely immaterial immediately falsifies the object in so far as it assumes falsely the presence of intelligible matter in the object. (58) Since the method of mathematics is proportioned to objects which abstract from sensible matter, it is therefore not proportioned to either the immaterial or to the object which includes sensible matter in its concept. It is this latter that Aristotle explicitly mentions when he says : Hence its method is not that of natural science; for presumably the whole of nature has matter."

Having exposed the reason why the mathematical method is improper to natural science, Aristotle then proceeds to the discovery

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57. "Quaedam vero sunt quae quumvis dependant a materia secundum esse, non tamen secundum intellectum, quia in eorum definiti-  
onibus non ponitur materia sensibilis, ut linea et numerus :  
et de his est mathematica." De Trinitate, Q. V, a. 1, c.

58. It is well to note, however, the efficacy of the mathematical method even when applied to physical bodies. It will fail to produce the minute accuracy, which characterizes it when used on mathematical objects, but it will produce an accurate account of one aspect of the physical thing, the quantitative.

of the correct method. Just as the basis for judging the unsuitableness of the mathematicians' method of demonstrating for natural science was the presence in the subject of that science of a character which is 'presumably' constant, i.e. sensible matter, so the basis for discovering the method of procedure proper to that science will be an examination of the subject itself. When we know exactly what that subject is, we will also know what the science must take into consideration in order to obtain as accurate an account of the subject as possible. This is what Aristotle means when he tells us that "Hence we must inquire first what nature is: for thus we shall see what natural science treats of."

The purpose, then, that Aristotle had in mind in composing book ii of the *Physics*, was to find the method of demonstration best suited to the science of nature. It is important that we keep this in mind, for, as we have mentioned, it is the incalculably valuable instrument for the interpretation of this work. Since the end is the measure of the means, the search for the method of demonstration proper to the *Physics* constitutes the *raison d'être* for all the multiple elements that go into the construction of book ii. The studies on nature, on the difference between the mathematician and the naturalist, on the extent of the object of the science, on the causes, their species and modes, on chance and fortune, on the question of whether nature acts for an end, on how necessity is found in nature, all of these must



be explained in the light of the search for that method of demonstration proper to natural science. Since they are means to that end, they can only preserve that intelligibility which is theirs in virtue of that end, by being studied under the aspect of an order to that end. For should one give any or all these various studies an abstract consideration (by abstract consideration I mean a study unrelated to the end that Aristotle had in view), he would condemn himself to a purely material knowledge of the Stagirite's thought as contained in book ii. This is not meant to disparage the great wealth of philosophical doctrine that can be found in these studies even when considered separately, but merely to insist on the primacy that must be given to their interpretation as related to the purpose of the book. Hence in order to avoid a purely material interpretation of the various parts of the book and at the same time not underestimate the mass of important philosophic truth that is present in these parts when considered as wholes in themselves, we will point out, as we progress, first the relation of the many parts to the principal objective of the book, and then develop each as its importance warrants.

### Chapter III

#### The Formal Role of Chapters i-ii

A study of book ii reveals that it is composed of two parts, each distinguished from the other by its respective subject matter. The first part, which embraces chapters i and ii, is devoted to the study of the subject of the science of nature, the second, which extends from chapter iii to ix, is concerned with establishing the method of demonstration proper to the science. (59) Since the thesis regards but chapters i and ii, the particular points to be studied are the various elements that go to constitute them. Moreover, their relationship to the remaining chapters of the book will be indicated. We intend to proceed according to the following plan. First we will seek to explain the two chapters and their various elements from the point of view of Aristotle's intention. After this we will expose the doctrine of the chapters.

#### The Formal Purpose of Chapters i-ii

##### A( The Principle of Interpretation.

In endeavoring to bring to light the function enjoyed

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59. "Unde hic secundus liber in duas partes dividitur: in prima de-  
"terminat de quibus sit consideratio naturalis scientia; in se-  
"cunda ex quibus causis demonstrat." St Thomas, II Phys., lect.  
1, n. 1.

by chapters i and ii of the second book of the Physics, two questions propose themselves. What is the relation of these two chapters to the whole book ? and What is the relation between the many elements to be found within the two chapters themselves ? Only by considering these questions can we be sure of obtaining a true understanding of Aristotle's procedure, and be certain of being in a position to pass judgement on the efficacy or inefficacy of that procedure.

The text from the Metaphysics (60), which we quoted in chapter II (61) in order to make apparent the primary purpose that Aristotle had in writing book ii, places in our possession two principles. The first and more important one is that the purpose which governs the whole book is the search for the method of demonstration proper to Natural Philosophy. This is the principle in the light of which every element, i.e. all the factors that go into the construction of the entire book, is to be interpreted and upon which must be based the judgement of the book's success or failure. The second principle, whose position is indeed a subordinated one but which, nonetheless, is of great importance, is the search for the definition of natural philosophy. It is in this that we are to find the *raison d'être* of the various sections found in the first two chapters. They are all ordered to the discovery of this definition; their right to

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60. Meta., a, 995a15-20.

61. p. 53.

be incorporated as parts of chapters i and ii, is to be decided by this end. Just as the investigation into the method of demonstration suited to the science of nature is the formal purpose of the whole of book ii, so too the investigation of the definition of the science constitutes the formal purpose of the first two chapters.

Thanks to these two we are equipped to study the order that exists between chapters i and ii and the rest of the book as well as that which exists between the elements that are the constituents of these chapters. Likewise because of them we are in a position to give a definitive judgement regarding the appropriateness of each to accomplish the intended end.

B) The Formal Purpose of Chapters i-ii.

1) Considered as part of the whole book.

Is there an order between the search for the definition of natural science and the investigation of the method of demonstration proper to that science? Aristotle's position on this question is beyond dispute. In a most emphatic manner he tells us that the first step in the direction of discovering the proper method of investigating physical things is to learn what nature is, for then one will find the things about which natural science must treat. (62)

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62. see citation, p. 52 (Chapter II).

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In other words Aristotle states that the necessary preamble to a successful investigation of the method of demonstration is the definition of the science of nature. Is he justified in his assertion? Is there so intimate a connection between the one and the other?

If we call to mind what we are intent upon discovering, we will find ample justification for Aristotle's assertion. We are seeking to find a method of procedure that will engender certain and evident knowledge of natural things. Such knowledge, however, can only be obtained through a knowledge of the causes of the thing. (63) Of prime importance, then, is the thing about which certain knowledge is desired, since to know it with certitude, demands a knowledge of it through the causes which are its ultimate explanation, upon which it depends for being exactly what it is, and because of which it cannot be other. The first step, then, in the search for the method of procedure which will insure such a knowledge is to examine the subject about which one desires to learn all that can be learned, in order to discover what is essential to it. This is necessary, for, since there are many methods of procedure, and since all are not equally suited

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63. "We suppose ourselves to possess unqualified scientific knowledge of a thing, as opposed to knowing it in the accidental way in which the sophist knows, when we think we know the cause on which the fact depends, as the cause of that fact and of no other, and, further, that the fact could not be other than it is." I Post. Analyticorum, c 11, 71b9-12.

to every type of subject (64), there is no sound basis for choosing the adequate method unless the elements which are essential to the subject-to-be-investigated, are first known. Only by learning these necessary notes of the subject is one in the position to pick the method appropriate to the demands of the subject. But how can we arrive at that sort of knowledge of a thing? How can we be certain that we have in our grasp all the notes that are essential to the thing? The only answer to these questions is the real definition of the thing. A real definition reveals to us what is essential to the defined, thus putting in our possession all the knowledge preliminary to the discovery of the method of demonstration. Once we attain to a true knowledge of the subject, there remains nothing other than the problem of selection, i.e. the work of comparing the various methods with the requirements of the subject in order to see which method is suitable.

This consideration of the role of the definition of a science in the discovery of the method of demonstrating conclusions about that subject verifies Aristotle's position on the need of first learning what nature is and through nature what the science of natural things must take into account, in order to reach the problem of method.

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64. The mathematical method is unsuited to provide an accurate account of physical things because it excludes from its scope sensible matter which is inseparable from them. Cfr *Meta.*, a. 986a15-20 (see p.

The relation between the two being what it is, it is entirely correct to state that chapters 1-11, considered as a unit, are very closely connected with the subsequent chapters which deal with the question of method. So intimately connected are these chapters, that one must designate them not merely as integral parts of the whole book, but rather as essential parts, since without the first two chapters there could not be those that follow.

11) Chapters 1-11 considered in their constitutive parts.

Having brought to light the order that functions as the connecting link between chapters 1-11 and the rest of book 11 and having shown the appropriateness of the two as a unit of the whole, we must now take up the question of the relation of those same two chapters to the many elements that are their matter. This question involves four treatises. First there is the definition of "nature", (65) then a discussion on "things called natural." (66) These are followed by a treatise on the distinction between the mathematician and the physicist (67) and one dealing with the extent of the field of the latter. (68) As has been noted, the guiding principle of the two

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65. II Physics, c 1, 192b8-193a9

66. *ibid*, 193a10-b20.

67. *ibid*, 195b22-196a11 (ch. 11)

68. *ibid*, c 11, 194a12-b15.

chapters is the search for the definition of the science of nature and it will be our problem to gauge the fitness of the four treatises to accomplish this end.

a) "Nature" and the Definition of Natural Science.

The first element that Aristotle introduces in his attempt to define the science of natural things, is the definition of "nature", the subject of the science. (69) Before entering upon the discussion of the relation of the definition of "nature" to the science of natural things, as an aid in the search for the definition of the latter, let us note here a restriction that will prevail, *mutatis mutandis*, in all those questions that are pertinent to the present consideration. In the examination at hand we are not interested in what precisely is the definition of "nature" or how one arrives at this definition. These points will become the subject of inquiry, when we come to that portion of the thesis which deals with the exposition of the doctrine of the two chapters. For the present we will limit ourselves to a consideration of the appropriateness of

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69. Joannes a S. Thoma : Curs. Phil., T. II (Phil. Nat.) p. 5a37-44:  
"Secundo tradit Philosophus ea, quae in hac scientia praesup-  
poni debent circa subjectum et principia seu media, quibus  
haec scientia demonstrat. Subjectum autem est id, quod natura  
constat, quod consurgit ex principiis in primo libro expli-  
catis, scilicet ex materia et forma; et sic agit de natura."



the various media employed by Aristotle in his investigation of the definition of natural science.

1) "Nature" and "Ens Mobile", a Substitution.

Before beginning our consideration of "nature" and its relation to the definition of the science of natural things, we feel that we must say something about a problem that is pertinent to this present section on "nature", that of the substitution of "nature" for "ens mobile". As we had occasion to mention in a previous chapter (70), the subject of the initial book of the 'Physics is "ens mobile". In that book Aristotle, after a through investigation, arrived at the constituent principles of mobile being itself. In other words he attained to the definition of the subject. With this definition one would think that Aristotle would have been amply prepared to undertake the work of defining the science he envisioned. Yet we know that he made a new beginning, investigating the subject under the title of "nature". The question immediately arises : Why this change ? Could not mobile being, defined through its constituent principles, serve as well in the investigation of the definition of the science of natural things ? Ordinarily Aristotle is never guilty of arbitrariness in his use of terms. Whether he employs a term loosely

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70. Chapter I, p.

or in a strict sense, there is always a justification. Because of this trait, it is incumbent upon us to seek out the reason for the substitution of the term "nature" for that of "ens mobile".

This problem of substitution is explicitly dealt with by John of Saint Thomas (71) and we can do no better than reproduce his treatment.

"But if you say : Why, then, did the Philosopher  
"treat of the principles of the natural thing in  
"the first book, and again in this second treat  
"about nature for the principles of the natural  
"thing, it is answered, that since nature is here  
"defined respectively, as St Thomas notes in this  
"second Physics, lesson 1, i.e. under the habitude  
"to movement, it is not inconvenient to have treated  
"about the principles of the natural thing in the  
"first book, in so far as from them is constituted  
"the natural being, either in becoming or having  
"become. Here, however, he treats of the principles  
"of the natural thing or of nature under the habitude  
"and respect to movement. For thus it takes on the  
"formality of nature, in so far as it is the prin-  
"ciple of movement, either actively or passively,  
"and (but) in such wise are the principles consider-  
"ed in the first book, as constituting natural being,  
"either in becoming or in having become, that there  
"the principle is considered not so much as active  
"and passive, but as material and formal. In the  
"present the principles are considered in truth, not  
"as constituting natural being, but as being the  
"principles of movement, and thus the principle is

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71. *Cursus Philosophicus*, 2. II (*Phil. Naturalis*), I P., Q. IX,  
Art. 1.

"considered as active and passive." (72)

To understand the point which John of St Thomas is here making, it is necessary to study this text closely, for a hurried reading of it will only result in a failure to grasp its importance. This is especially true since such a reading gives only the impression of an extended repetition of the same thought, an impression in no way justified, as the examination of the structure of the thought process contained in the text reveals.

In that part of the text which immediately follows the question, John of Saint Thomas intends to justify the twofold consideration of the principles of natural being simply from the fact

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72. Joannes a. S. Thom., *ibid.*, p. 171a31-b12. "Quodsi dicas: Cur  
"ergo Philosophus agit de principiis rei naturalis in primo li-  
"bro, et iterum in hoc secundo agit de natura pro principiis  
"rei naturalis, respondetur, quod cum natura definiatur hic  
"respectivo, ut S. Thomas advertit in hoc 2<sup>o</sup> Phys., lect. 1, id  
"est sub habitudine ad motum, non inconvenit de principiis  
"rei naturalis tractasse in primo libro, quatenus ex illis  
"constat ens naturale, sive in fieri sive in facto esse. Hic  
"autem de principiis rei naturalis seu de natura agit sub ha-  
"bitudine et respectu ad motum. Sic induit enim rationes na-  
"turalis, in quantum est principium motus, sive active sive  
"passive, atque ita in primo libro considerantur principia  
"ut constituentia ens naturale, sive in fieri sive in facto  
"esse, ibique non tam consideratur principium ut activum vel  
"passivum quam ut materiale et formale. In presenti vero  
"considerantur principia non ut constituentia ens naturale,  
"sed ut principiantia motum, et ita consideratur principium  
"ut activum vel passivum."

that they are different. In other words he is stating that Aristotle is not being merely repetitious. The two treatments are not identical, though they both concern the same thing, the principles of natural being. The first treatment involves the principles in so far as they are the constitutive elements of natural being. The second concerns these principles under the aspect of nature, i.e. with a habitus to movement. Having thus far justified the twofold consideration, he shows the great difference that arises from these diverse treatments. The fact that the principles of natural being are defined through nature, which is itself definable through an order to movement, clothes these principles with an aspect, that is foreign to their consideration as principles constituting natural being. Conceived as nature, these principles become active and passive principles of movement, whereas conceived as constituents of natural being, they are merely material and formal principles of mobile being. It was to bring out this new aspect of the principles of natural being, John of St Thomas concludes, that Aristotle treated these principles a second time.

From this text we discover the reason which John of St Thomas underlines as justifying the second treatment accorded the principles of natural being by Aristotle and hence the substitution of "nature" in the place of natural being's intrinsic principles. It is because mobile being, from the point of view of its constituent

principles, does not possess the formality of being a principle of movement, in an active or passive sense. Though he does not, in the text, explicitly state why such a defect is serious, it is not too difficult to show. We need but call to mind what he said about the 'ratio formalis quae' of the science of natural things, that this science is interested in natural things qua mobile. (73) If one considers natural being according to its constitutive principles, matter and form; no account being taken of privation; the study bears on natural being considered statically, for matter and form are not principles of becoming, but rather of being. While such a treatment is not offensive to the Metaphysician and the Mathematician, it is definitely so to the Physicist, whose whole raison d'être for being classified as distinct from the other two, is that in all his studies he has a special point of view, namely he treats natural things under the aspect of their becoming or movement. Except for this distinctive approach, there is no justification for the Physicist qua Physicist. To be exact, the offensiveness of natural being considered statically is that it causes a disparity between the definition of the subject, which should function as the medium of demonstration (74) and the

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73. Curs. Phil., T II, Q. 1, Art. 1.

74. "Pursus, cum omnis scientia per demonstrationem habeatur, demonstrationis autem medium sit definitio; necesse est secundum diversum definitionis modum scientias diversificari." St Thomas, I Physics, lect. 1, n. 1.

"ratio quae". The two are not proportioned to each other. The consideration of natural being in its constitutive elements does not provide the Physicist with those principles upon which must be based the ultimate explanation of natural being under the aspect of becoming. And without such principles there is no science of the becoming of natural things. Natural being conceived in its principles of being falls well within the orbit of the Metaphysician as well as in that of the Mathematician, but in no way in that of the Physicist. It might not be amiss to note here that the Physicist also suffers badly at the hands of Descartes who makes impossible the very "ratio quae" of the science of nature. By his rejection of movement as the act of the potential qua potential (in Descartes' opinion movement is not a mixture of potency and act but simply act) (75), he rejects that intermediate between existence and non existence, becoming. Since becoming is inadmissible, all consideration of natural things must be either on the metaphysical or the mathematical level.

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75. "At vero nunc videntur illi verba magis preferre, quae vim habent occultam supra captum humani ingenii, qui dicunt nos tam, rem unicuique natissimam, esse actum entis in potentia, prout est in potentia? quis enim intelligit haec verba? quis ignorat quid sit motus? et quis non fateatur illos morbum in scirpo quaevisisse? Dicendum est igitur, nullis unquam definitionibus ejusmodi res esse explicandas, ne loco simplicium compositas apprehendamus; sed illos tantum, ab aliis omnibus secretas, attente ab unoquoque et pro lumine ingenii sui esse intuentes" Regulae ad directionem ingenii, edit. Adam et Tannery, p. 486.

This is precisely the defect of the first treatment given by Aristotle to natural being. This consideration approaches natural being taken statically. It emphasizes the constitutive principles of the natural thing, whether in fieri or in facto esse. It does not concern itself with the becoming of these same things. Because he realized its shortcomings, because he was aware that the principles he had just established, were insufficient, he proceeded to make the necessary readjustment. This readjustment, the bringing of the principles into line with the "ratio formalis quae" of the science he had in mind, was accomplished successfully by a reconsideration of the principles under the aspect of "nature". Thanks to this substitution of "nature" for natural being in its constituent principles, the hiatus that existed between the constituent principles of natural being and the point of view of that same natural being proper to the Physicist, disappears.

2) "Nature", its Relation to the Definition of Natural Science.

To answer the question of the relation of the definition of "nature" to that of natural science, it is necessary that we call attention to two notions closely associated with every science, the subject and object of a science. John of Saint Thomas defines these two in the following manner. "The subject (of a science), however, is that about which certain predicates or passions are inferred and proven in

the conclusions;"(76), "The object (of a science) is something complex, namely that which is manifested through the science, as inferred and proven, namely the conclusions;". (77) Each of these has a material and a formal aspect. (78) The formal aspect of the subject being called the "ratio formalis quae", that of the object is called the "ratio formalis sub qua". (79) That there are two such formalities, further, that there is an order between the two formalities and what precisely is that order, is clearly indicated by Cajetan in his Commentary on the Summa Theologica, where he states that there must be a distinction between the formalities of the object of a science because of the distinction between the two genera in which the object of science must be located, (80) and that the

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76. Curs.Theo., Ia Pars, Disp.2, art. xi, par.1, p. 402: "Subjectum autem est illud de quo in conclusionibus praedicata aliqua seu passionibus inferuntur et probantur;"
77. ibid: "Objectum scientiae est aliquid complexum, scilicet id quod per scientiam manifestatur tanquam illatum et probatum, scilicet conclusiones, ut docet S. Thomas (II-II q. 1, a. 1)"
78. ibid: "Distinctio autem materialis et formalis in objecto et subiecto ex eo explicatur....etc."
79. Cajetan, Commentarium in Summa Theologica, Ia Pars, Q.1, Art.8, par. III: "Ad evidentiam huius rationis nota duplicem esse rationem formalem objecti in scientia: alteram objecti ut res, alteram objecti ut objectum; vel alteram ut quae, alteram ut sub qua."
80. ibid, par.IV: "Necessitas autem, et qualitas et distinctio harum rationum sumenda est ex distinctione duorum generum in quibus oportet locare objectum scientiae. Oportet enim quod formaliter sit talis res, taliter scibilis. Et ideo oportet quod et habeat rationem formalem constituentem formaliter ipsam in tali esse reali, et rationem formalem constituentem formaliter ipsam in tali esse scibili; ut sic reponatur et in genere rerum et in genere scibilium; quemadmodum objectum sensus est in duobus generibus, scilicet sub passibili qualitate et sub sensibili."



"ratio formalis sub qua" is a passion of the "ratio formalis quae. (81)  
To fully understand the statement that the "ratio formalis sub qua" is  
a passion of the "ratio formalis quae", it is necessary that we first  
make note of the difference between the two formalities. The "ratio  
formalis quae" is that formality by which a thing is formally constitut-  
ed in 'tali esse reali', (82) while the "ratio formalis sub qua" is  
that formality by which the same thing is formally constituted in 'tali  
esse scibili'. (83) The first formality, then, is nothing more or less  
than the essence of the thing, (84) and the second, while it adds nothing  
to the essence of the thing, is nevertheless a passion of the thing in

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81. *ibid*, par. IV: "Unde illae (propriae differentiae entis constitu-  
tivas entium in generibus suis realibus) intrinsece constituunt  
subjecta, istae (speculabiles propriae differentiae quae nihil  
ponunt in entibus) constituunt quasi passiones eorum; quandoqui-  
dem et speculabilitas entis passio est."
- par.VII: "Ad hoc dicitur, negando subiectum. Quoniam antecedens  
supponit indistincte pro formali ratione objecti sive ut res,  
sive ut objectum; quamvis sit manifestatum quod rationem forma-  
lem objecti ut res, tum quia notior est, tum quia convertibiliter  
se consequuntur illae duae rationes formales, ut subiectum et  
passio, ut dictum est."
82. *ibid*, par. III: "Ratio formalis objecti ut res seu quae est ratio  
objectae rei quae primo terminat actum illius habitus et ex qua  
fluunt passiones illius subjecti, et quae est medium in prima  
demonstratione; ut entitas in metaphysica, quantitas in mathema-  
tica, et mobilitas in naturali."
83. *ibid*: "Ratio formalis objecti ut objectum vel sub qua, est imma-  
terialitas talis seu talis modus abstrahendi et definiendi; puta  
sine omni materia in metaphysica, cum materia intelligibili tan-  
tum in mathematica, et cum materia sensibili, non tamen hac, in  
naturali."
84. *ibid*, par. V: "Habet igitur objectum scientiae duplicem rationem  
formalem, alteram quidditativam sibi ut res est,"

so far as the thing is knowable or speculable. (85) It is that by which the thing, constituted in such or such a fashion in the real order, is now placed in another order, that of the speculable. But we have not gone sufficiently far to manifest just why one ratio is a passion of the other. To do this we must first show the identity that exists between the order of the speculable and the order of abstraction.

The speculable is a designation appended to a thing in virtue of its order to the intellect. Now the root of all knowledge or speculability is immateriality or separation from matter. (86) Since matter is the principle of obscurity, being potential and not actual, only by its removal can a thing be made intelligible. (87) Therefore, in order that a thing be in the order of the speculable, it is necessary that it be separated from matter. Hence, when we say that the "ratio formalis sub qua" is that formality by which a thing is

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85. *ibid*: "alteram denominativam sui simpliciter, quidditativam  
"autem sibi ut est sub genere scibilis; quod est esse sub  
"genere objecti, quoniam scibile species est objecti."

86. J. & S. Thomae, *Curs. Phil.*, T. I, Q. XXVII, Art. 1, p. 823a2-10:  
"Supponit enim D. Thomas pro fundamentali principio, quod  
"unusquisque res tantum est intelligibilis, in quantum est a  
"materia separabilis, eo quod intelligibile idem est quod  
"spirituale et immateriale, principium autem spiritualitatis  
"est denudatio a materia."

87. *ibid*, a10-14: "Et sic, cum materia obumbrat et impedit in-  
"telligibilitatem, illuminatur et apparet abjectum, secundum  
"quod a materia discernitur diversimode."

formally constituted in "esse scibile" or the order of the speculable, we are stating that it is the formality by which a thing is separated from matter, made abstract. With this in mind we can now turn to the point made by Cajetan, namely that the "ratio formalis sub qua" is a passion of the "ratio formalis quae", i.e. it depends, like all passions, on the "ratio formalis quae" in its role as subject of the passion.

As we have mentioned, the necessity for abstraction arises from this that the condition of intelligibility is separation from matter. In this sense the "ratio formalis sub qua" does not depend upon the "ratio formalis quae" of the thing but rather on the intellect. That is, it finds its *raison d'être* in the fact that the intellect must abstract things in order that they be made proportioned to it and also that it may uncover their intelligibility. But if the intellect is to know the thing as it is, and not in a fashion that is in opposition to the thing's objective condition, it must proceed with caution. This is necessary in order to avoid making the thing either more abstract or less abstract than is warranted by the real conditions of the thing itself. In other words there must be a definite terminus to the intellect's operation of abstraction relative to a particular object. For example, if man is the object of inquiry, the mind must beware lest in its operation of making the object-man proportioned to itself, it abstracts from sensible matter, which pertains to the object-man in 'esse reali'. This terminus, which is the "ratio formalis sub qua", can only be known through a knowledge of the thing in

'esse reali', i.e. by a knowledge of the "ratio formalis quae". It is in this sense that the "ratio formalis sub qua" is a passion of the "ratio formalis quae". It indicates the degree of abstractibility proper to the thing, in so far as it is founded upon and flows from the constituent principles of the thing in virtue of which that thing is placed in "tali esse reali".

Having clarified these notions, we can now come to grips with the original problem, the relation of the definition of "nature" to the definition of the science of natural things. Why does Aristotle deem it necessary to commence his investigation of the definition of the science of natural things with an investigation of the definition of "nature"? To one who is in any way familiar with the aristotelian doctrine on the specification and distinction of the theoretical sciences, (88) this procedure might well appear useless, unnecessary. If the theoretical sciences (and there can be no doubt that the science of natural things is, in Aristotle's opinion, a theoretical science)(89) are specified and distinguished from one

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88. Meta., E, c i; Meta., E, c vii.

89. "That physics, then, is a theoretical science, is plain from these considerations." Meta., E, c i, 1026a3.

another by the "ratio formalis sub qua", why concern oneself with the "ratio formalis quae" of their subject? (90) Were it possible to give a complete justification to the diverse "ratio sub qua" by which sciences are formally specified by merely attending to the "ratio formalis sub qua" itself, one could, with justice, criticize Aristotle for introducing material that was unserviceable, that was not 'ad rem'. But no such complete justification can be attained by attending solely to the "ratio formalis sub qua". The "ratio formalis sub

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90. The distinctions of the formalities of the object of science, i.e. the "ratio formalis quae", the "ratio formalis sub qua", as well as a further distinction of the latter: "ratio sub qua specificativa ex parte objecti, et ratio sub qua specificativa ex parte habitus" (cfr. J. a S. Thoma, Curs. Theo., T. I, Disp. 2, art. 7, par. 15, p. 379-380) are distinctions introduced by the scholastics, not by Aristotle. Their importance consists in this that they make explicit certain notions which are contained implicitly in Aristotle's distinctions of "the mode of the being of the essence and the mode of definition" (Meta., E, c 1, 1025b29-30), distinctions in the "basic truths" (I Post. Anal., c xxviii, 87a37) and which are necessary to make explicit in order to show how no vicious circle is involved in the specification of science. (Cfr. Curs. Theo., locus citatus, par. XIV, p. 379.

qua" or that abstractibility proper to the object of science must be founded upon the thing itself, if one is to have a science of real things, and, in the case of physics, a science of natural things. Without a norm designating and limiting the abstractibility proposed as proper, the science would become a logical one, and not a real one. That foundation, that norm which designates and limits, is, in the ultimate analysis, the "ratio formalis qua" or the definition of the formal subject of the science. It is that factor which alone is capable of determining the abstractibility of the object of a science, i.e. its "ratio formalis sub qua". It was precisely for this purpose that Aristotle began with the definition of the formal subject of natural science. He was intent upon establishing the foundation upon which was built that formality, the "ratio formalis sub qua", by which he would later distinguish the science of natural things from all other theoretical sciences.

b) "Things called nature" and the definition of the science of natural things.

This second treatise offers little difficulty by way of justifying its incorporation into the investigation of the definition of the science of natural things. Actually it is the logical consequent of the treatise on "nature", when that treatise is examined from the point of view of the substitution we have spoken of.

Having substituted "nature" for natural being in its constitutive elements and having established its definition, Aristotle felt constrained to bring out clearly the identity "quoad rem" of the principles spoken of as constituents of natural being and those spoken of under the aspect of "nature". As we know, the principles

of natural being are considered from diverse angles. In the first instant (81) they are examined under the formality of constituents of natural being, in the second (82) as principles of movement. In order to make clear that he is not speaking of different subjects, but the same subject under diverse formalities, Aristotle, having defined nature, now adequates matter and form to "nature", saying that matter is nature (83), form is nature. (84) By doing this he establishes beyond any doubt the identity of the principles of being and of becoming 'secundum rem' and thereby shows the unity that exists between the two considerations on principles. They are both principles of natural being, the subject of the science of natural things. Save for this adequation of "nature" and matter and form, one might be inclined to suspect Aristotle of compiling a series of unconnected treatises.

In this study of "things called nature" Aristotle goes into a minute examination of many points of importance, such as, the various significations of form and their respective right to the title of "nature", the preeminence of form over matter relative to this

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81. I Physics, cc 1-9.

82. II Physics, c 1, 192b6-193a9.

83. "This, then, is one account of nature, namely that it is the "immediate material substratum of things which have in themselves a principle of motion or of change." II Phys., 193a25.

84. "Another account is that 'nature' is the shape or form which is specified in the definition of the thing." *ibid*, 193a30.



designation, the composite and "nature". All these will be taken up in the exposition of the doctrine of the chapters under consideration.

c) The Distinction Between the Mathematician and the Physicist  
and the Definition of the Science of Natural Things.

With the definition of "nature" and the identity between the principles as constituents of natural being and as "nature" out of the way, Aristotle introduces the third of the treatises, a discussion which centers about the distinction between the mathematician and the physicist.

The occasion for this discussion is the fact that the mathematician and the physicist have a community of subject-matter. On this point Aristotle writes: "Obviously physical bodies contain surfaces and volumes, lines and points, and these are the subject-matter of mathematics." (95) He likewise mentions another similarity between the two in what are called the physico-mathematical sciences and which he designates as "the more physical branches of Mathematics" (96), i.e. the part of mathematics which are more physical than mathematical. In these latter sciences we find a process the inverse of that which is proper to pure mathematics. Whereas pure mathematics

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95. II Physics, c 11, 193b24.

96. *ibid*, 194a7.

considers physical lines, points etc, not qua physical, i.e. as the termini of physical bodies, the physico-mathematical sciences studies the mathematical lines, points, etc., but applies its conclusions to physical bodies, i.e. it considers these as sensible or physical. (97) The intention, however, behind this discussion is not so much to distinguish mathematics, pure or applied, and physics for the sole purpose of differentiating between them, as it is through their distinction to arrive at the formal element of the definition of the science of natural things, the "ratio formalis sub qua".

Not any difference whatever is sufficient to constitute the basis for a division among the sciences, but only that differences which touches the order of speculability qua talis, (98) for, since science is an intellectual habit (99), it must seek its principle of diversification in its object, not considered in any fashion but as an object, i.e. with an order to the intellect. For example, the

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97. "These (optics, harmonics, and astronomy) are in a way the converse of geometry. While geometry investigates physical lines, but not qua physical, optics investigates mathematical lines, but qua physical, not qua mathematical." *ibid*, 194a8-10.

98. Cajetan, *Comm. in Iam Partem*, Q. 1, Art. 3, par. IV : "Et propter-  
ea illa sola entis divisio diversificat habitus speculativos,  
"quae infert propriam divisionem speculabilis ut speculabile est,  
"per proprias differentias ipsius speculabilis."

99. J. a S. Thomas, *Curs. Phil.*, T. I, p. 792a24-27: "est habitus qui  
"versatur circa conclusionem notam ex propositionibus universali-  
"bus, necessariis, et immediatis."

physicist and the astronomer treat of the same heavens, a fact upon which Aristotle insists. (100) Again, the mathematician and the physicist consider the same points, lines, surfaces and volumes. Here we find an identical material object for mathematics, natural philosophy, as well as for astronomy and natural philosophy. Since there is an unified material object, these sciences cannot very well find the basis for their distinction there. Nor can they be differentiated formally as sciences by reason of the distinctions found in their definitions, e.g. entity in metaphysical definitions, quantity in those of mathematics, mobility in physical definitions. Though such differences indicate the ultimate foundation of the distinction by which the sciences are diversified, they are not the formal principle of specification. They are not the formal principle of specification because differences in definition are not founded upon the order of the thing to science but upon the order of the thing to itself. (101) The only distinction that differentiates the sciences as such is the distinction in the degrees of abstraction or immateriality, for this distinction is based on the order of the thing to the intellect. Any change in the degree of immateriality produces a new intelligible

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100. Meta. (B), c 11, 997b14-35.

101. J. a S. Thoma, Curs. Phil., T. I, p. 821a21-26; "Ceterum hoc "(diversa definitio subjecti) insufficienter dicitur. Nam "restat explicare, in quo constat ille diversus modus definiti- "endi in una scientia et in alia, sicut aliter definit quan- "titatem physicus, aliter mathematicus."

object, and with this new object a new science. (102)

Since the mathematician does not consider points, lines, surfaces and volumes as the termini of natural bodies, which in fact they are, and since he also omits from his account motion or change, (103) he abstracts from their sensibility, leaving only matter which is intelligible and hence the "ratio sub qua" of his science is the second degree of abstraction. The Physicist, however, regards these same things as termini of natural bodies, and both the termini and the bodies under the aspect of movement. He must, therefore, take into account that sensibility from which the mathematician abstracts. (104) Because he does consider this sensibility, his "ratio sub qua" is the first degree of abstraction or abstraction from individual sensible matter.

The consideration given by Aristotle to the distinction between physics and physico-mathematical sciences is introduced because it serves so well to bring out the "ratio formalis sub qua" of

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102. *ibid.*, p. 823b14-17: "Et secundum magis vel minus receditur a materia et materialibus conditionibus, redditur aliquid diversum modo intelligibile;"

103. "Now the mathematician, though he too treats of these things, nevertheless does not treat of them as the limits of a physical body; nor does he consider the attributes indicated as attributes of such bodies." *II Phys.*, c ii, 193b31-33.

104. "That is why he separates them; for in thought they are separable from motion, and it makes no difference, nor does any falsity result, if they are separated." *ibid.*, 193b34.

physics. It serves admirably because there is a greater similarity between these two than between mathematics and physics. Physics-mathematical sciences are natural quantum ad terminum, i.e. their consideration bears on lines, points, etc., qua physical or sensible. Yet despite this common term, they are distinguished from physics by the fact that they are in the second degree of abstraction from the point of view of their principles which are those of pure mathematics.

Arriving at this point in his work, Aristotle now has the "ratio sub qua" of the science of natural things. It is a science which is specified by the first degree of abstraction.

d) The Extent of the Field of the Physicist and the Science of Natural Things.

Ordinarily one would have thought that having succeeded in making clear the formality which specifies the science of natural things and hence the formal element in its definition as a science, Aristotle would have proceeded immediately to his original task, the determining of the proper method of demonstration. Instead he brings up a new discussion, one which concerns the limits of the field of investigation of the physicist.

The reason for the postponement of the principal objective of the book in favor of this new discussion is that the

Identification of matter and form with "nature" (105) presents a problem. "Since there are two natures, with which is the physicist concerned? Or should he investigate the combination of the two? But if the combination of the two, then each severally. Does it belong then to the same science or to different sciences to know each severally?" (106) There can be no doubt about matter falling within the scope of the physicist, since, as has been established, his science does not abstract from sensible matter. But should one place all the emphasis on matter, as did the ancients (107), especially when we consider "nature" after the analogy of art which is an imitation of nature and recall to mind the principle that it pertains to the same discipline to know the form and the matter? (108) Yet, if we take the investigation of the combination of the two as the concern of the physicist, it will necessitate a study of the two and this raises the problem of the limits of the study of each, more specially with regard to form. Just how far, or in what manner is the

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105. section b, chapter III.

106. II Physics, 194a15-18.

107. "If we look at the ancients, physics would seem to be concerned with the matter." II Physics, 194a19-20.

108. "But if on the other hand art imitates nature, and it is the part of the same discipline to know the form and the matter up to a point... if this is so, it would be part of physics also to know nature in both its senses." Ibid, 194a21-23.

physicist to treat the form ? (109)

In answer to these questions Aristotle shows that nature in both senses, i.e. as matter and form, is the concern of the physicist. And though form is more nature than matter, (110) it must never be considered by the physicist apart from matter, otherwise the treatment will not be physical. (111) At this point Aristotle indicates the limits of the science in regard to its study of form. It belongs to the science of natural things to study a form which is capable of existing even when separated from matter, viz, the human soul, but its consideration must never bear on that form as separable but as in matter. To treat the human soul in its separability pertains, not to the physicist, but to the metaphysician whose function is to study the mode of the existence and the essence of the separable as such. (112) With this remark Aristotle closes this part of the second book of the *Physics*, quite certain that he is now in possession of a sufficiently precise knowledge of the

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109. "How far then must the physicist know the form or the essence ?"  
ibid, 194b10.

110. "The form indeed is nature rather than the matter, for a thing  
"is more properly said to be what it is when it has attained  
"to fulfillment than when it exists potentially." ibid, 193a6.

111. "and the physicist is concerned only with things whose forms  
"are separable indeed, but do not exist apart from matter."  
II *Physics*., 193a6.

112. "The mode of existence and essence of the separable it is  
"the business of the primary type of philosophy to define."  
ibid, 194b15.

science of natural things to take up the problem of discovering the method of scientific procedure suitable to this science.

We have now seen the role of the first two chapters with reference to the prime purpose of the book, as well as the function played by the four treatises which make up the two chapters. Now it remains for us to expose the doctrine step by step.