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- ① Section philosophique (Plan) 1p.
- ② 6e cours: l'abstraction formelle 4pp.
- ③ partie d'une thèse pp. 225 à 268.
- ④ B) L'abstraction mathém. selon l'école thomiste pp. mime'o. 33 à 40.
- ⑤ Autres notes sur: le "speculabile"  
l'espèce impress et expresse  
références pour la 1<sup>re</sup> lec. du I<sup>er</sup> l. des Phép.  
De Trin. II, a. 2.  
"Materia et ~~objecta~~ subjectum" alicujus scientiae  
abstraction

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Math. mod. étudié et les propriétés de  
constructions que nous savons et voulons  
faire.

## INTRODUCTION A LA METHODOLOGIE.

### Section physique.

I) Les notions physiques fondamentales: longueur, temps, masse.

II) Les principes :

a) méthodologiques

1) de définition

*de causalité  
indétermin.*

2) d'homogénéité

3) de conservation

b) physiques:

1) longueur — relativité

2) l'homogénéité des électrons

3) la conservation de la matière — énergie

III) Les lois physiques: relations algébriques entre nombres — mesures

exemples:

1) loi de gravitation (non statistique)

2) loi de Mariotte (statistique)

3) deuxième loi de la thermo-dynamique (statistique)

IV) L'Hypothèse:

a) les principes méthodologiques

b) les principes physiques

c) les lois physiques

V) La Théorie: Une synthèse qui permet d'unifier l'ensemble des lois au moyen d'hypothèses complémentaires, et qui suggère de nouvelles expériences qui seront l'occasion de modification accidentelle aux lois ou de la découverte de nouvelles lois, qui suggèreront de nouvelles théories, qui suggèreront de nouvelles expériences, et ainsi à l'infini.

VI) CONCLUSION: La physique expérimentale, qui n'est pas une science au sens Aristotélicien, ne nous donne du monde qu'une connaissance dialectique, connaissance qui retient notre intelligence à l'état de tendance vers un terme qu'on n'atteint jamais adéquatement: le monde en soi, tel qu'il est connu par une intelligence qui ne dépend pas de l'expérience.

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Difficulté:

1. de Trin. V 3. c. fine: /c/. copie p. 5)

Caj., Ia, q. I, a. 3, n. IV:

(a) Universalia non subsistunt in sua universalitate.

(b) Sed res possunt subsistere in suis abstractionibus propriis, diversimode:

- Metaphysica, sec. propriam abstractionem subsistunt: quoniam habent in rerum natura individua abstracta, ab omni materia sensibili et intelligibili, ut patet de intelligentiis.

- mathematica vero secundum propriam abstractionem sumpta, non existunt, quoniam nullum habent in rerum natura individuum abstractum a materia sensibili; non enim invenitur haec linea, nisi in terminatione corporis sensibilis.

- Naturalia autem, cum nullam habeant propriam abstractionem, sed eam tantum quae communis est omnibus scitibus, scil. qua universale abstrahit a particulari; manifeste patet quod subsistunt in rerum natura, dum habent individua subsistentia cum materia sensibili, et ceteris conditionibus in universali sciti.

Remarquez que dans les deux cas, cette abstraction est opposée à l'abstraction totale; et de cette abstraction opposée à l'abstraction totale, l'on dit: ~~que~~ "haec competit physice" et "naturalia nullam habent propriam, sed eam tantum...."

2. Cette doctrine est-elle en contrad. avec JST? Nullement. D'ailleurs, Cajetan se contredirait lui-même dans son comm. sur Ia q. I, a. 3 f. p. I, a. 3.

## Solution

### Remarquez

1° Que l'on peut étudier un corps  $\left\{ \begin{array}{l} \text{comme être mobile} \\ \text{comme quantité} \\ \text{comme être} \end{array} \right.$

Donc, la métaphysique peut étudier des sujets qui ne peuvent exister sans matière sensible.

D'autre part, la Ph. Nat., Raite de Substances séparées, ~~comme~~ moteurs immobiles; donc elle peut étudier des choses qui existent sans matière.

Et tout cela est compris dans l'objet formel de ces sciences.

2° Donc, ~~on peut considérer un objet~~ la raison formelle d'un objet est de deux sortes:

(a) d'une est la raison formelle de l'objet considéré dans son être propre: *objectum formale in se rei*.

(b) D'autre est la raison formelle de l'objet comme objet.

3° La div. de l'abstraction donnée de Trin. V 3, et Caj. I/V/3/IV est fondée sur le degré d'immatérialité de l'objet in se rei. Comme les êtres mobiles ne sont pas sans matière, tant que ni nous appuyons sur leur être propre, il ne peut y avoir abstraction formelle.

4° Or, remarquez que si notre science était adéquate, nous aurions de chaque chose une science propre. Mais une science conditionnée par l'abstraction totale ne peut plus rejoindre adéq<sup>t</sup> les nature à cause de la potentialité introduite par l'abstraction.

5. Maintenant: dans ce que nous avons abstrait par l'abstraction totale, nous pouvons atteindre une formalité, non pas comme commune aux individus ou aux espèces, dont elle est prédicable, mais comme objet ayant la détermination d'un objet "de *objectum scilicet de qua passio quaedam demonstratur.*"

Et cette ratio formalis objecti in esse scitabili n'est pas considérée dans la potentialité qui lui convient en tant qu'abstrait d'abstraction totale, mais en tant qu'elle est un acte intelligible: donc, en tant qu'elle est éloignée de la matière sensible.

Raisons maintenant JdsTh. I 829.

Mais, quel rapport y a-t-il entre cette abstr. formelle et la première?

Est-ce la m?

JStTh. semble le dire, p. 822b.

Pi c'est la m, ~~il y a contradiction entre PTh et JStTh~~ il est en contrad. avec S. Th. - Mais cela n'est pas: \*

- (a) P. Th. Ia q I, a. 3
  - (b) l'aj. ibid. q. deinf.
- } ils ne parlent pas d'abstraction formelle.

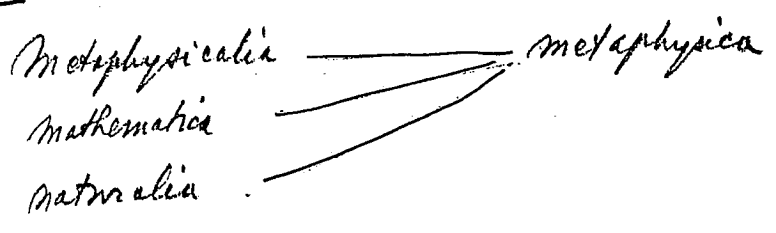
Non, la raison pour lap. JdsTh. parle ainsi, c'est pourq' il parle de la raison formelle de la division des sciences: i.e. de la distinction des habitus.

Donc, il s'agit ici de l'abstraction formelle regardée par rapport à notre intelligence.

S. Thomas dans de Trin. considère les ~~espos~~ objets in esse rei: i.e. dans leur abstraction propre: les naturalia, les metaphysicalia etc.

Alors "de his rebus abstractis in propria abstractione" et metaph.  
Mais, la metaph. traite aussi de rebus quae non sunt abstractae in esse, ~~sed~~ rei, sed in esse objecti."

Donc



(4)  
C'est pourquoi, si on se place du côté des objets in se, seuls  
les mathématiques sont abstraits d'abstr. formelle; i.e., la  
séparation n'est pas dans les choses, mais dans notre  
intelligence seulement.

ness, especially in view of the fact that every line, surface, etc., is, as an existing thing, a sensible line, surface, etc., and consequently a mobile thing.

I) Mathematical Abstraction, is it justified?

To attempt a justification of mathematical abstraction without first showing what abstraction is, would be impossible. Therefore in the present section we will consider (a) the 'quid sit' of abstraction, (b) its species, and (c) Mathematical abstraction, what it is and how justified. The 'an sit' of abstraction we omit here, because we have already touched this point in our discussion of the necessity for immateriality in the object of the intellect.

a) Abstraction's 'Quid Sit':

Abstraction, as the latin word from which it is derived (abstrahere) suggests, is a separation. But because it is a separation that is made by the mind, we must first investigate, as St Thomas does in 'De Trinitate', (261) the signification of the word 'separation' with regard to the two operations of the mind which effect the separation. This is necessary in order to obtain the exact notion of what abstraction is.

The meaning of the word 'separation' differs when used

in connection with the first and second acts of the mind. That such is the case, will become evident from an examination of the objects of the two operations. The first operation of the intellect, that of the intelligence of indivisibles, i.e. essences, regards the very nature of the thing, by which the thing understood obtains a definite grade in the hierarchy of beings. (262) The second operation, which is the act of composing and dividing by affirmation and negation, touches upon the very existence of the thing, which, in composite being, is the result of an aggregation of the principles of the thing, while in simple substances, it accompanies the incomposite essence. (263) Now the separation that is effected by the second act is limited to things that are separated one from another *secundum rem*. The cause of this restriction is that logical truth, which is formally found in the second act of the mind, consists in a conformity of the intellect to the thing and hence, were the intellect to separate things that were not separated *secundum rem*, it would be false. (264) To say that a man is not a musician, which is a case of separating man and musician, is true only if he is not a musician in reality, but false, if he is one. The situation with regard to se-

262. "Prima quidem operatio respicit ipsam naturam rei, secundum quam aliqua res intellecta aliquem gradum in entibus obtinet; sive sit res completa ut totum aliquod, sive incompleta ut pars vel accidens." *ibid*, corp.

263. "Secunda operatio respicit ipsum esse rei, quod quidem resultat ex aggregatione principiorum rei in compositis, vel ipsam simplicem naturam rei comitatur, ut in substantiis simplicibus." *ibid*

264. "Et quia veritas intellectus et ex hoc quod conformatur rei, patet quod secundum hanc operationem intellectus abstrahere non potest quod secundum rem conjunctum est, quia in abstrahendo significatur esse separatio secundum ipsum esse rei." *ibid*



paration is different, however, in the case of the first operation of the mind. Because it terminates in the nature or essence of the thing and does not touch its existence, it is possible for the intellect, through this first act, to separate things that are together in 'esse reali'. But there is here, too, a limit. Some things are separable, but not all. For, since the first act of the mind attains to the essence of things, and since the essence is understandable only in so far as it is act, the intellect can know an essence in one of three ways: (1) as an act, (forms by themselves and simple substances) (2) as the act of something (composed substances are known through their form), (3) through a habitude to act (prime matter known through its habitude to substantial act). (265) Now, if the act, which constitutes the very 'ratio' of the nature, has an order and a dependence on something else, then the nature itself is not intelligible without that 'something else', irrespective of the manner in which the act and that 'something else' are connected. The two might be joined together as whole and part, or as matter and form/subject and accident, or as relatives, which, though separated secundum rem, like father and son, are not separable secundum intellectum, but as

265. "Cum enim unaquaeque res sit intelligibilis secundum est actu, ut dicitur X Metaph., oportet quod ipsa natura vel quidditas rei, intelligatur, vel secundum id quod est actus quidem, sicut accidit de formis ipsis, et substantiis simplicibus, vel secundum quod id quod est actus eius, sicut substantiae compositae per suas formas; vel secundum id quod ei loco actus, sicut materia prima per habitudinem ad formam, et vacuum per privationem locati: et hoc est illud ex quo unaquaeque natura suam rationem sortitur." ibid.

long as one depends on the other, the nature is not understandable without both, and hence in these cases separation of things joined together is not possible. Outside of this restriction, the intellect can, by its first act, separate things joined together in any of the manners described, i.e. as part and whole, as form and matter, (we exclude from possible separation those things joined as relatives, since they cannot be ever understood one without the other.) The reason for this is that in these cases the things connected do not pertain to the nature of each other, which is the object of the first operation, and hence they can be considered apart.

From what has been said, we can differentiate between the meanings of the word 'separation' as used in connection with the two acts of the mind. Since the second operation can only separate things that are so 'secundum rem', and this under the penalty of being false, it is obvious that the word here means - "one thing is not in the other" (266) But because the first act can separate things that are joined together 'secundum rem', so long as their act, which constitutes the 'ratio' of their essence, has no dependence on the things joined with them, 'separation' has a different meaning. In this case it signifies "the consideration of one thing, without the consideration of the other, either as to its presence in or absence from the essence under examination". (267)

266. "Sic igitur intellectus distinguit unum ab alio aliter et aliter  
 "secundum operationes: quia secundum illam qua componit et dividit,  
 "distinguit unum ab alio per hoc quod intelligit unum alii non in-  
 "esse;" *ibid*
267. "in operatione vero qua intelligit quid est unumquodque, distinguit  
 "unum ab alio, dum intelligit quid est hoc, nihil intelligendo de  
 "alio, neque quod sit cum eo, neque quod sit ab eo separatum." *ibid.*

Of the two meanings attached to the word 'separation', only that which signifies "one thing is not in another", is, properly speaking, separation, for separation is formally opposed to unity and continuity (268) and hence is verified only in the case of things that are not together 'secundum rem'. But if this be so, and St Thomas insists that it is, as we shall see in a moment, what about the other 'separation', i.e. "the consideration of one thing, without the consideration of the other thing, either as to its presence in or absence from the nature under examination" ? If it is not separation, what is it? It is, as St Thomas observes, more correctly called abstraction. (269) But even here we are obliged to make a distinction. The separation that is effected by the first act of the mind is abstraction only when the thing separated is joined with others 'secundum rem' according to the mode of part and whole, or form and matter, (270) In cases where the first act separates things that are separated in 'esse physico', e.g. when it considers an animal and does not consider a stone, it is a question of 'separation' and not abstraction, (271)

268. "Nam distinctio seu pluralitas vel multitudo opponuntur unitati vel identitati, divisio vel separatio unioni seu continuitati." J. a St Thoma, Curs. Phil., T. I, Q. II, (Pars 2a), Art. 3, p. 294a24-28

269. "Haec autem distinctio recte dicitur abstractio:" De Trinitate, ibid

270. "sed tunc tantum quando ea quorum unum sine alio intelligitur, sunt simul secundum rem." ibid

271. "Non enim dicitur animal a lapide abstrahi, si animal absque intellectu lapidis intelligatur." ibid.

at least fundamentally, though not formally. I say fundamentally, because the stone is not in the animal 'secundum rem' and this is the basis for that formal separation which is made by the second act of the mind.

The appropriateness of designating the mind's consideration of the essence of one thing, without understanding anything about the things connected with it 'secundum rem', but not pertinent to its 'ratio' as abstraction and not as separation, is most certainly proper. Such a consideration cannot be called a separation, because this term properly means non-union, whereas there is actually present a union. But it can be called abstraction, since this designation, signifying a taking away from another, implies that there is a union between the thing taken away and that from which it is taken. Further, the restriction of abstraction to those instances where the first act of the mind considers a thing, without considering the things joined with it 'secundum rem', is amply justified, for, if the thing considered by the act of the mind is actually separated from other things that do not enter into the mind's consideration of its object, one can hardly say that the object was taken from the others, since it never had any union with them.

Since abstraction, like separation, is a means by which the intellect distinguishes one thing from another, (272) and, moreover since abstraction, unlike separation, concerns the distinction, made by the mind's operation, of things that are joined together 'secundum rem', we can define it in the following manner. Abstraction is an act proper to the first operation of the mind, by which the intellect distinguishes one thing from another or others to which this one is joined 'secundum rem', either as part and whole, or as matter and form/subject and accident, (273) in so far as the intellect knows the 'quid rei' of the one, while understanding nothing about the other or others, i.e. as to whether it or they be joined to or separated from the nature known.

b) The Species of Abstraction:

"Therefore, since abstraction cannot be, properly speaking, except of things joined together 'secundum rem', according to the two aforesaid modes of conjunction, namely, by which part and whole are joined, or form and matter; abstraction is twofold: one by which form is abstracted from matter, the other by which the whole (is abstracted) from the parts." (274)

This citation from the De Trinitate reveals two things:

(1) that abstraction is diversified by the differences of the modes

272. "Sic igitur intellectus distinguit unum ab alio aliter et aliter secundum operationes:" *ibid.*

273. "Unde, cum omnia accidentia comparentur ad substantiam sicut forma ad materiam," *ibid.*

274. "Unde, cum abstractio non possit esse, proprie loquendo, nisi conjunctorum secundum rem, secundum duos modos conjunctionis praedictos, scilicet qua pars et totum conjunguntur, sive forma et materia; duplex est abstractio: una qua forma abstrahitur a materia, alia qua totum a partibus." *ibid.*

by which things are joined together, (2) that there are only two species of abstraction. The first point is easily established, once we recall to mind that abstraction is an act. Because it is an act, its principle of specification must be the object with which it is concerned. (275) Now, the object of abstraction is a thing connected with other things 'secundum rem', which the intellect considers without considering the others. If, therefore, there are any per se differences of such an object, these will diversify abstraction, as they will diversify the object. What are the differences of the object of abstraction? The sole difference of this object, taken in its widest sense, is to be <sup>found</sup> ~~discover~~ in the differences of the mode of conjunction by which the thing considered and the things not considered are joined 'secundum rem', for some are united as part and whole, others as matter and form/subject and accident. But the mere fact that there are differences in the mode of conjunction is not sufficient grounds for postulating these as principles of specification for abstraction. What is necessary, is to show whether these are differences of the object of abstraction, qua object. Are they such differences? The answer is affirmative. The differences in the mode of conjunction are differences of the object qua object, since they affect it in its conjunction with other things, which is the formality which makes the object an object of abstraction and not of separation. Moreover, the fact

that the thing which is abstracted, might be joined to another as whole and part or as matter and form, results in diverse formalities that pertain to the thing in virtue of the peculiar type of connection it has with others. Things that are joined as matter and form have the formality of potency and act, while those connected together as whole and part, have the formality of superior and inferior, of universal and particular. (The exact effect of these diverse formalities will be treated when we come to portray the differences between formal and total abstraction) Since the differences are per se differences of the object, it follows that the diversity in the modes of conjunction distinguish the species of abstraction.

The second point made by St Thomas, which concerns the number and identity of the species of abstraction, offers a difficulty. If the diverse modes of conjunction found the types of abstraction, and there are two modes: whole and part, matter and form: why are there not four instead of two species, total and formal, partial (by which a part is considered and not the whole) and material (by which matter is considered without form, e.g. material substance without quantity)? To answer this question <sup>best</sup> requires information that can only be obtained through a consideration of two recognized species, total and formal. Hence we will treat first total and formal abstraction and then return to the problem of why there are only two species instead of four.

Formal abstraction is defined as that by which "what is formal~~s~~ is abstracted from what is material" (276) or more explicitly "that by which form is abstracted from matter, act from potency, the essential and proper from what is extraneous and foreign." (277) Total abstraction is that "by which a totum universale is abstracted from its subjective parts. (278) This second is of two types. There is a total abstraction which involves the abstraction of a genus from its species, e.g. animal as abstracted from man, lion, horse, etc., the species of animal, or the abstraction of what might be termed the supreme genus from species and genera. (279) An example of this would be 'ens', the 'praedicatum communissimum'. Then there is the total abstraction by which a nature is abstracted from all the singulars, i.e. individuals. An example of this is the abstraction of common sensible matter from individual sensible matter, the type of abstraction proper to Natural Philosophy. It is this second that is total abstraction in its strictest and most proper sense, since the part from which the whole is abstracted is actually a part in the strictness sense. Now the two abstractions

276. "ita duplex est abstractio per intellectum, scilicet qua formalis abstrahitur a materiali," Cajetan, De Ente et Essentia, Prooemium, n. 5, circa primum. (p. 6, Editio Laurent.)
277. "Vocatur abstractio formalis, qua forma abstrahit a materia, actus a potentia, essentialis et proprium ab extraneo et alieno." J a St Thomas, T I, (Logica, II Pars) Q. 2, Art. 2, p. 358b6-9
278. "et qua totum universale abstrahitur a partibus subjectivis." Cajetan, De Ente et Essentia, ut supra.
279. "Primo ut habet conditionem istam, quae est abstractio totalis, non dico a singularibus sed a speciebus et generibus." ibid
280. "Tertio modo ut neutram istarum conditionum habens, abstractum tamen a singularibus." ibid



have<sup>∞</sup><sub>^</sub> certain feature in common and also certain differences. We will consider first the common feature.

Since, as we mentioned before, the intellect, even in its first operation, cannot separate or abstract all the things that are joined together 'secundum rem', but only a few (281) both formal and total abstraction have a limit, which is, that only when the things joined together do not depend upon each other for the understanding of the essence of at least one of those things, can abstraction be made. As applied to formal abstraction it means that not every form can be abstracted from matter. Hence <sup>not</sup> ~~neither~~ substantial forms can be abstracted from the matter that corresponds to them, since the formality of being an act of something, namely matter, pertains to their definition. Nor can accidental forms be separated from their subject, the substance, for the very 'ratio' of accident depends on substance as its subject of inherence, since an accident is "that to which it pertains to be in another as in a subject." (282) What forms can be abstracted, we will reserve for a later consideration. As in the case of the form, not every totum can be abstracted from its parts. To understand this it is necessary to distinguish between the parts of a totum. There

281. vide pp. 227-228

282. "Ab illa materia non potest forma abstrahi per intellectum a qua suae essentiae ratio dependet. Unde, cum omnia accidentia comparentur ad substantiam, sicut forma ad materiam, et cuiuslibet accidentis ratio dependeat ad substantiam, impossibile est aliquam talem formam a substantia separari." De Trinitate Q. 5, art. 3, corp. (St Thomas)

are two types of parts, the 'partes speciei' and the 'partes materiae'. (283) The 'partes speciei', so denominated because they pertain, secundum se, to the totum in so far as it has a certain essence (284), are in reality constituent parts, i.e. they are the parts upon which the very essence of the totum depends. (285) Such parts are matter and form, with regard to composed substances, the letters of the alphabet relative to words, the elements of a mixture relative to the mixture. The 'partes materiae', so named because, in contradistinction to the other type of parts, these do not pertain secundum se, to the totum in so far as it has a certain essence, (286) are parts that merely "happen to the species" or totum (287), since they are not constitutive of its nature, and hence accidental. Examples of these parts are the finger, hand and foot of man. None of these enter into the constitution of man's essence. To parts of matter are reduced also all signate parts, such as this body, this soul, these bones, this flesh. (288) The reason for this is because

283. "et tales partes dicuntur speciei, et formae, - - - - - Et  
"hae partes dicuntur partes materiae," *ibid.*

284. "Hoc enim dixit ad speciem pertinere, quod secundum se inest  
"unicuique speciem habenti;" VII Meta., lect. 9, n. 1475

285. "Sunt enim quaedam partes a quibus totius ratio dependet;  
"quando scilicet hoc est esse toti tali quod ex talibus  
"partibus componit; sicut se habet syllaba ad litteram, et  
"mixtum ad elementa: et tales partes dicuntur speciei, et  
"formae, sine quibus totum intelligi non potest, cum ponantur  
"in eius definitione." De Trinitate, *ibid.* ut supra.

286. "Sed id quod est materiale ad speciem, nunquam dicendum est  
"secundum se de specie." VII Meta., lect. 9, n. 1473

287. "ad materiam vero quod accidit speciei." *ibid.*, n. 1475

288. "et ita se habent ad hominem omnes partes signatae, sicut haec  
"anima, et hoc corpus, et hoc os, et huiusmodi. Hae sunt partes materiae

individual differences are outside the essence of a thing. (289)

The '*partes speciei*', because they are constitutive, are thereby prior to the totum. The totum, as a definitum, is defined through the '*partes speciei*' which are its *definientia*. The '*partes materiae*', however, are posterior to the totum to which 'they happen', and hence they do not define it, but rather are defined by it. E.G. the eye is defined as an organ of an animal, 'this man', John, is defined through man. With these distinctions on the kinds of parts that pertain to a totum, we can now turn to the statement we made about not every totum is capable of being abstracted from its parts.

With regard to the '*partes speciei*', no totum can be abstracted from them, for the totum is constituted through these and hence is dependent upon them. Since they are essential to the *quod quid erat esse* of the totum, it is impossible to have it, without having the parts. For example, one cannot abstract man from his constitutive parts, animality and rationality, and have man. But the totum can be abstracted from those parts which merely 'happen to it', because the '*partes materiae*' are posterior to the essence of the totum and hence are not required for its intelligibility. One need not think about a man's foot or hand, or about this man and that man, in order to understand man. Therefore total abstraction is possible only in regard to a totum and its '*partes materiae*', not in regard to the totum and its '*partes speciei*'.

While we could, as St Thomas does in the *De Trinitate*, show now why the species of abstraction are limited to two; for the discussion of the limits attached to both the formal and total abstraction gives us the needed information; in the interest of keeping a unity to this section on the species of abstraction we will postpone the settlement of that question until we have completed this next part.

We now come to the differences between formal and total abstraction. This consideration is of more importance than that on the similarity of the two, because, whereas the similarity has its foundation in the fact that both types belong to the genus of abstraction, the differences are founded on what is proper to each as a distinct species. Cajetan (289) lists four differences that exist between formal and total abstraction; (1) differences regarding the concept of the thing abstracted and the thing from which it was abstracted, (2) differences in the attributes proper to the thing abstracted, (3) differences in the knowability of the thing abstracted, and (4) differences in the role of each type of abstraction relative to science. We will briefly examine each of these differences and point out their various foundations. It might be added here that this examination of these differences and their fundaments will confirm the position we took on a previous

289. *De Ente et Essentia*, Prooemium, n. 5, (p. 6-7, Editio Laurent)

page(290)regarding the diverse modes of conjunction and the diversification of abstraction.

(1) Difference regarding the concept:

The first difference noted by Cajetan between formal and total abstraction regards the concept of the abstracted thing and that of the thing from which the abstraction was made. In formal abstraction, after the abstraction has been accomplished, there remains two complete concepts, one not containing the other. (291) When 'surface' is abstracted from sensible matter, there are two complete concepts, that of surface and that of sensible matter. The 'surface' qua surface has its own definition, which does not include sensible matter, for a 'surface' is a magnitude of two dimensions. Likewise there is a complete concept of sensible matter, since its definition does not include 'surface', for sensible matter is defined through sensible qualities. The situation is not the same in the case of total abstraction. Here there are no longer two complete concepts, one of the abstracted whole, the other of the parts (signate parts or species as parts of a genus), but only one, namely that of the abstracted whole. (292) When man is abstracted from the

290. vide pp. 232-233

291. "Primo, quia in abstractione formali seorsum uterque conceptus completus habetur: eius scilicet quod abstrahitur, et eius a quo abstrahitur, id est, formalis et materialis, ita quod conceptus alter alterum non includit." Cajetan, De Ente et Essentia, p. 6

292. "In abstractione vero totali non remanet seorsum uterque conceptus completus, ita quod alter alterum non includat: sed unus tantum eius scilicet quod abstrahitur." ibid

~~from the~~ individual man, there is only one complete concept, namely that of the totum 'man'. There is a complete concept of this totum because it does not depend for its definition on the individual, since the individual is outside the nature. But there is no complete concept of the individual from which 'man', the totum, was abstracted, and the reason is because the individual cannot be defined without recourse to the nature, of which it is an individual instance. But, since this has been abstracted, the individual remains without a definition. The basis for this distinction between formal and total abstraction is to be found in this, that the latter occurs through the consideration of something that pertains to the nature of the inferior, and the removal or non-consideration of that element which belongs to the ~~ratio~~ 'ratio' of the inferior as inferior.

(293) If we cast an eye back to the example used, this last statement will become clear. In abstracting the totum which is man, from the individual, the mind considers 'man', the abstracted whole, which pertains to the ratio of the individual in so far as he has a certain essence or nature, but does not consider his individuality which belongs to him in so far as he is an individual. What is left, after the abstraction, is nothing but the individual qua individual, which is not defineable save through the nature which has been removed. here-

293. "Fundamentum huius differentiae est quod illa (totalis) abstractio fit per considerationem alicuius, quod est de ratione inferioris, et per remotionem, id est non considerationem alicuius, quod est de rationis illiusmet inferioris." *ibid.*

fore there can be no complete concept of that from which a totum is abstracted, in so far as that thing is considered by itself. Formal abstraction, however, does not take place in this manner. It occurs through the separation of those things that have an aspect of form, from those which have an aspect of matter. (294) In other words, the thing from which another is abstracted as form from matter, while it has a material aspect relative to the thing abstracted, nonetheless it is, in itself, an actual thing, whose actuality does not depend on the thing abstracted. This becomes more evident when we recall that formal abstraction is restricted to cases where neither the form nor the matter have an essential dependence on the other. This means that if the form and the matter are so related that the form is the act of this matter and the matter the corresponding subject of this act, there can be no abstraction. The result of this is to restrict formal abstraction to such forms as are not the sole and exclusive form of that matter from which it is separated, and to such matter as is not absolutely potential relative to the form abstracted, but only as is not absolutely potential relative to the form abstracted. Consequently since the matter is not totally potential, but only relative to the form abstracted, it must have an actuality that belongs to it, when considered outside that abstracted form. And, because of this actuality, it too, like the form abstracted, can be defined. The example used by Cajetan will help manifest this. The

294. "Ella autem abstractio (formalis) non fit per considerationem alicuius quod sit de ratione materiae, et non per considerationem alicuius, quod sit de illius ratione: sed potius fit per separationem eorum quae sunt de ratione formalis, ab his quae sunt de ratione materialis, et e converso, ut exemplum datum ostendit." *ibid.*

line has the aspect of form with regard to sensible matter, in so far as it is a limit. But, because it is not the form of sensible matter qua sensible, it can be abstracted. Again, the sensible matter of the line is not potentially sensible, but it is potentially limited, i.e. it is potential to the line which is a limit. Therefore, after the abstraction of the line has taken place, matter remains sensible. It continues to possess that actuality of being sensible, because being sensible does not depend on the line, but on sensible qualities. Since it retains that actuality, even after the line has been abstracted, sensible matter is capable of being defined and hence of a complete concept, just as the line, which is not the form of sensible matter, but merely a form in sensible matter, is capable of being defined and, consequently, of a complete concept.

2) Difference in the attributes proper to the thing abstracted:  
Difference in the knowability of the thing abstracted:

Though they are listed separately, we propose to combine the second and third differences between formal and total abstraction into one consideration. This befits them, for the third difference is a corollary of the second, as is clear from the fact that Cajetan gives one and the same fundament for both. (295)



In this second and third difference we are no longer concerned with the thing from which something is abstracted, but concentrate our entire attention on the thing abstracted. The object that is abstracted through formal abstraction, has, by virtue of this abstraction, the following properties: actuality, distinctness and intelligibility. (296) The object which is the fruit of total abstraction is characterized by the confusion of potentiality and less intelligibility. (297) Furthermore, the two types of abstraction differ from each other from the point of view of their limits. The more abstract the object of formal abstraction, the more known it is by nature. (298) The phrase 'more known by nature' means that the nature of the thing is more knowable. (299) It is the inverse of this in the case of total abstraction. The more abstract the object of total abstraction, the more known it becomes for us, (300) and, consequently, less known by nature. The connection that exists between 'more known for us' and 'less known by nature' will be shown when we examine the foundation of

296. "Secundo differunt, quia per abstractionem formalem oritur in  
"eo quod abstrahitur actualitas, distinctio et intelligibilitas." *ibid.*

297. "In abstractione vero totali oritur in eo quod abstrahitur  
"potentialitatis confusio, et minor intelligibilitas." *ibid.*

298. "Tertio differunt, quia in abstractione formali quanto aliquid est  
"abstractius tanto est notius naturae." *ibid.*

299. "Non ergo dicit notiora naturae, quasi natura cognoscat ea; sed quia  
"notiora sunt secundum se et secundum propriam naturam." *I Phys.*  
lect. 1, n. 7

300. "In abstractione vero totali quanto est abstractius tanto est  
"notius nobis." *De Ente et Essentia*, supra.

these differences.

The reason behind these differences is to be found in the very process of abstraction. Formal abstraction proceeds by removing matter. In doing this it leaves behind all that obfuscates and retains only the form which is act. (301) By formal abstraction, then, one attains to the form, which, because it is act, has the characteristics of actuality and distinctness and, as a consequent of these, intelligibility. Because its object has these qualities, it follows, that, in this order, by becoming more abstract one attains to an object that is more actual, more distinct and more intelligible. This is so because the higher one goes in this order of formal abstraction, the form, which is the thing abstracted, becomes correspondingly freer from matter and potentiality and hence more and more act. But the object which is more act, is the object that is known by nature, for, since entity is the basis of knowability and the thing that is more in act has more entity, such a thing is more knowability by nature. (302) Total abstraction, on the other hand, proceeds by removing from the abstracted totum the parts. By this removal there is left behind those specific or individual actualities (depending on whether the totum abstracted is a generic or specific one) by which nature is determined to be this nature or

301. "Fundamentum harum differentiarum est quia abstractio formalis fit per separationem a materialibus potentialibus et huiusmodi." *ibid.*

302. "Sunt autem secundum se notiora, quae plus habent de entitate: quia unumquodque cognoscibile est in quantum est ens. Magis autem entia sunt, quae magis in actu: unde ista maxime sunt cognoscibilia naturae." *I Phys., lect. 1, n. 7.*

or that nature; to be the nature of this one instead of that one. (303)

For example, in abstracting animal from its species, one must relinquish the specific actualities which make animal either rational or irrational. The same is true in abstracting the nature of man from the individuals. This can be done only by leaving behind those individual actualities, which make the nature to be John's nature, or Jame's nature. In divorcing the totum of its actualities, one is left with that which is common, hence potential and, since act is the principle of intelligibility, a less intelligible thing. As a consequence of this, the further one advances in this order of total abstraction, the more potential and less intelligible object does (304) he attain. This is not difficult to see. To become more abstract in this order is possible on the condition that one divests the thing of more and more of its actualities and thereby arrive<sup>s</sup> at a thing more and more potential, since the universality of a thing is proportioned to its potentiality. The thing that possesses determinations is less applicable than the thing without determinations. Yet, by becoming more and more abstract in this order, one attains to objects which, while they are less knowable by nature, are more knowable to us. They are less knowable by nature, because they are more potential than actual and act is that by which a thing is

303. "Abstractio autem totalis fit per separationem a specificis actualitatibus," *ibid*

304. "a quibus quanto est abstractius, tanto est potentialius, cum genus potestate contineat inferiora; et tanto est minus intelligibile, cum actus secundum se notior potentia." *ibid*.

a thing is intelligible. Their very potential condition, however, makes them objects most intelligible to us, for, since our intellect is pure potency in the order of intelligible things, (305) the object that is proportioned to it, is not the thing intelligible by nature, i.e. removed from matter and potentiality, but the object which is a mixture of potentiality and act. (306) The greater the predominance of potentiality in the object, the more proportioned it is to the intellect, understanding, of course, that some act must be present, since there is no intelligibility whatever, where there is nothing but potency. Hence, the most abstract thing in the order of total abstraction is the most intelligible for us.

3) Difference in the role proper to each type of abstraction relative to science:

With regard to this last difference Cajetan merely mentions the difference. He says that it is formal abstraction, according to its diverse modes, which is the principle of specification for the theoretical sciences, (307) while total abstrac-

305\* "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 Theologica, I. P., Q. 87, Art. 1, corp.

306\* "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." ibid., Q. 85, Art. 3, c

307. "Quarto differunt, quia penes diversos modos abstractionis formalis scientiae speculativae diversificantur, ut patet VI Metaph. De Ente et Essentia, ibi supra n. 304.

tion is common to all sciences. (308) The reasons for this distinction of roles played by the species of abstraction with regard to science, are not too difficult to assign. We have just seen that formal abstraction cloths the object abstracted with actuality, distinctness and hence intelligibility, and that the more abstract that object becomes, the more intelligible it is. We have also seen in our discussion on the principle of specification of theoretical science, that differences in intelligibility are per se and specific differences of the speculable qua speculable and therefore principles differentiating the sciences that have the speculable as their object. But these differences in intelligibility are nothing other than the differences in the grades of formal abstraction (which correspond to the various grades of abstractibility or immateriality proper to things) and hence formal abstraction, according to its diverse grades, is the principle of specification for theoretical science.

That Total abstraction is not a peculiar feature of any one science, but the common property of all sciences so that no one science is differentiated from another by reason of the fact that it considers the whole and not the part, is clearly established by the following consideration. Science 'in communi'

308. "Abstractio autem totalis communis est omni scientiae,"  
ibid.

treats of things that are necessary, i.e. things which cannot be otherwise than they are, seeking out the causes and the per se properties of the same. (309) Now essences or natures are necessary, but the individual who possesses the essence or nature, is not necessary, for he can be otherwise, since he can be and can 'not be'. Nor does his singularity pertain per se to his essence, seeing that the individual is not such by reason of the essence but by reason of matter signed by quantity. (310) Hence all sciences, since their object is the necessary, abstract from the individual and consider only the universal nature. (311) But the universal nature is ~~the fruit~~ of total abstraction which separates the nature from the individuals possessing that nature. Therefore total abstraction is common to all science.

309. "Circa primum sciendum est quod id cuius scientia per demonstrationem quaeritur, est conclusio aliqua in qua propria passio de aliquo subjecto praedicatur: quae quidem conclusio infertur ex aliquibus principiis." I Post. Anal., lect. 2, n. 2:

On the object of science being something necessary, see I Post Anal., c 2, 71b9-12. (p. 35, note 74)

310. "Nam natura speciei individuatur per materiam: unde principia individuantia et accidentia individui sunt praeter essentiam speciei." III De Anima, lect. 8, n. 706

311. "Tertia secundum compositionem universalis a particulari: et haec competit etiam physicae, et est communis omnibus scientiis: quia in omni scientia praetermittitur quod est per accidens, et accipitur quod est per se." De Trinitate, Q. 5, Art. 3, corp (circa finem)

Having shown the similarity and the differences between formal and total abstraction, we now turn to the question of why there are only these two species of abstraction. St Thomas  
 7 / ( unhesitatingly refuses to countenance any additional species. He says: "there are not found abstractions opposed to these, by which a part is abstracted from the whole, or matter from form!" . (312) His reasons are compelling. Let us examine first why he insists that there is no abstraction of part from whole. There are, as we have said, two types of parts, the 'partes materiae', which do not pertain to the constitution of the 'ratio' of the whole but are subsequent to it, and the 'partes speciei', which are constituents of that 'ratio'. If we consider the 'partes materiae', e.g. the finger, or hand of a man, there can be no abstraction of the part from the whole. The reason is because such parts depend upon the whole for their definition, hence without the whole they are unintelligible. The finger is a man's finger and without this order to man it is not a finger. (313) Nor can the 'partes speciei' be abstracted from the whole. The reason for this, however, is not the same as in the previous case. The 'partes speciei', since they constitute the 'ratio' of the whole, are prior to the whole and do not depend upon it in definition. For instance the line which enters into

312. "Non autem inveniuntur abstractiones eis oppositae, quibus pars abstrahitur a toto, vel materia a forma:" ibid

313. "Digitus autem non potest esse sine homine, quia digitus absocius non est digitus," VII Meta., lect. 9, n. 1466.

the constitution of the triangle in so far as a triangle is a figure bounded by three lines, is not defined through the triangle, but rather defines it. Now, because they are prior to the whole, the 'partes speciei' can be understood apart from the totum. But this solitary consideration of the part aside from the whole, is not abstraction but separation. Abstraction is proper only in cases where the things are joined 'secundum rem', while separation pertains to instances where things are not joined together 'secundum rem'. (314) But the line, and the class of 'partes speciei', of which the line is an example, can be without the totum whose constituent it is, (315) For not every line is necessarily a part of a triangle, since, secundum rem, it can be separated from the triangle. This consideration of the line without the triangle is not abstraction but separation, because in things that are able to be divided, the distinction of one from the other is ~~rather~~ separation, since there is no union between the two, rather than abstraction, which presupposes and demands a union. (316) Therefore, while there is a separation of a certain type of part from the whole, there is no abstraction.

Nor is it possible to have a species of abstraction by which the matter is abstracted from the form. One cannot speak

314. vide p. 229

315. "vel potest etiam sine toto esse, si sit de partibus speciei, sicut linea sine triangulo, vel littera sine syllaba, vel elementum sine mixto." De Trinitate, Q 5, art. 3 (circa finem.)

316. "In his autem quae secundum esse possunt esse divisa, magis habet locum separatio quam abstractio." ibid



of matter being abstracted from either substantial or accidental form. Certainly not from substantial form, for prime matter has an essential dependence on form, since it can only be defined through form which is its proper act. (317) With regard to matter and accidental form we must distinguish between sensible matter and such forms as quantity and figure, and prime matter and those forms, and consider each case separately. Relative to sensible matter there can be no abstraction of that matter from either quantity or figure, which is a species of quality and is defined as a mode resulting from the termination of quantity. (318) This mode can be either intrinsic, i.e. it is the mode of the quantity considered in itself, as the figure of the hand, or it can be extrinsic and in this case it is the result of the position in which the quantity is found. (319) For example, the figure of the clenched fist or the distended hand is not the result of the hand as hand, but of a position assumed by the hand. This extrinsic figure is called "figura situialis". The reason, given by St. Thomas, why sensible matter cannot abstract from either quantity or

317. "Similiter autem cum dicimus formam abstrahi a materia, non intelligitur de forma substantiali, quia forma substantialis et materia correspondens dependent ab invicem, ut unum sine alio non potest intelligi, eo quod proprius actus in propria materia fit." *ibid*

318. "Figura sumitur dupliciter: --- Secundo pro modo resultante ex terminatione quantitatis." J. a St Thomas, *Curs. Phil.*, T I, (II Pars *Logicae*), Q XVIII, Art. 3, p. 620a39-43

319. "Et haec vel potest esse intrinseca, sicut figura manus in se, et sic est qualitas; vel extrinseca et situialis, sicut eadem manus complicata vel dilatata diversam figuram situalem exhibet." *ibid*, a43-48.

figure, is because the sensible qualities, by which matter becomes sensible, cannot be understood unless quantity (and ~~figure~~ figure, though St Thomas does not explicitly state this) be understood first. (320) The explanation of this is to be found in the manner in which the sensible qualities move the sense. The sensible qualities move the sense "corporaliter et situalter" (321) in so far as the greatness or the smallness of the sensible object and its closeness or distance from the sense affect the mode of the action of the sensible object. (322) Now, quantity and figure are intimately bound up with ~~when~~ "corporaliter et situalter" whereby the sensible quality moves the sense. Quantity is indispensable to the "corporaliter", since a body is great or

320. "sed intelligitur de forma accidentali, quae est quantitas et figura, a qua quidem materia sensibilis per intellectum non potest abstrahi, cum qualitates sensibiles non possunt intelligi; non praeintellecta quantitate, sicut patet in superficie et colore:" ibid
321. "Qualitates enim sensibiles movent sensum corporaliter et situalter." II De Anima, lect. 13, n. 394.
322. "Quaedam vero alia faciunt differentiam in transmutatione sensuum, non quantum ad speciem agentis, sed quantum ad modum actionis. Qualitates enim sensibiles movent sensum corporaliter et situalter. Unde aliter movent secundum quod sunt in maiori vel minori corpore, et secundum quod sunt in diverso situ, scilicet vel propinquo vel remoto, vel eodem vel diverso. Et hoc modo faciunt circa immutationem sensuum differentiam sensibilia communia." ibid

small by reason of quantity. Figure, i.e. taken in the extrinsic sense, cannot be separated from the "situaliter", since a magnitude is near or far from the sense by reason of its position, which position gives rise to the "figura situialis". Therefore, since the sensible qualities do depend on quantity and figure, sensible matter cannot be understood without them and cannot, consequently, be abstracted from them. But there is an objection against this connection between the two. Cajetan in his *De Ente et Essentia* says, and we quote: "and, conversely, the sensible matter of the line has completely its own definition, not including anything of the line in so far as it is a line." (323)

If the sensible matter of the line is capable of being defined without reference to the line, which is quantity, then there does not exist an intimate and essential connection between the two.

In response we must distinguish Cajetan's statement in the following manner. Sensible matter of the line has its own definition independent of the line in so far as line here is taken as a certain species of quantity, namely a magnitude of one dimension, concedo. Sensible matter of the line is independent in its definition of the line, taken in the sense of representing, not a species of quantity but quantity itself, nego. I distinguish the conclusion in the same manner. The explanation is that the sensible qualities do not depend

323 "et e converso, materia sensibilis lineae habet complete suam definitionem non includentem aliquid lineae, in eo quod linea: *De Ente et Essentia*, Prooemium, p. 6 (Prima differentia)

"quantum ad transmutationem sensuum", on only one species of quantity, such as a line, for there are sensible surfaces and sensible bodies, as well as sensible lines. What these qualities do depend on, as we have shown, is quantity, in so far as quantity, because it is the order of the parts of a substance, extends the object. This function does not pertain to quantity in so far as it is exclusively a line, or surface or body. In other words sensible matter depends on quantity by reason of its generic element and not by reason of those differences which constitute its species. This is the explanation of why Cajetan declares sensible matter independent of the line, adding the qualifying phrase, "in so far as it is a line".

Can prime matter be abstracted from the form of quantity? and from figure? St Thomas' answer is that prime matter can be separated from quantity and hence from figure, but not abstracted. The reason he gives is that "the substance which is matter, can be intelligible without quantity; whence to consider substance without quantity, pertains more to the genus of separation than abstraction." (324) At first glance this seems hardly adequate. If matter's capacity to be understood without quantity, is the reason why such a consideration pertains to separation and not to abstraction, why cannot the same be said of the consideration, say, of quan-

324. "Substantia autem quae est materia, intelligibilis esse potest sine quantitate: unde considerare substantiam sine quantitate, magis pertinet ad genus separationis quam abstractionis." De Trinitate, Q. 5, Art. 3 (circa finem)

tity without sensible matter? Like matter relative to quantity, quantity is intelligible without sensible matter. Then, why should not this be called separation rather than abstraction, even though St Thomas clearly states that it is abstraction? (325) The resolution of this difficulty is to be found in the different reasons why, on the one hand, prime matter is intelligible without quantity and hence figure, and, on the other, why quantity is intelligible without sensible matter. Quantity is intelligible without sensible matter not because it is separated 'secundum rem' from sensible matter (quantity is a form in sensible matter, to which it has the relation of form to matter), but because quantity does not depend, in its essence or definition, on sensible matter. Hence the separation of the two is not separation strictly and formally taken, but abstraction, which properly functions among things joined together 'secundum rem'. Prime matter, however, is intelligible without quantity because, considered in itself, it is separated 'secundum rem' from quantity. Quantity is not a passion, 'secundum rem' of prime matter (for prime matter is ens in potentia and cannot be the source from whence emanates an act, even though it be an accidental act, such as quantity) but it is a passion of the corpus, which is a composite of prime matter and form. Therefore, when one considers

325. "Et de his abstractis est mathematica, quae considerat quantitates, et ea quae quantitates consequuntur, ut figuram et huiusmodi." *ibid* (circa medium)

prime matter by itself, he is dealing with a thing that, 'secundum suam entitatem', is not joined to quantity. But separation is the proper designation for the distinction of things which are not connected 'secundum rem'. Therefore, there is not abstraction of prime matter from quantity, though there is a separation of the two.

c) Mathematical abstraction, its justification:

The abstraction that is proper to Mathematics as a distinct theoretical science, is formal abstraction in the 2nd degree, whereby the form of quantity is removed from common sensible matter, for, as Aristotle tells us, the mathematician does not consider lines and points, volumes and surfaces as limits of sensible bodies. (326). In other words, he does not treat the physical body as physical, but solely as pertaining to the genus of quantity. (327) Can he do this? We have already shown that it is possible for the mind to consider one thing and not consider things joined to that one, under certain conditions. It remains for us to see whether the mathematician's abstraction of quantity from sensible matter fulfills the condition, namely that it does not depend on the thing from which it is abstracted 'secundum definitionem'.

326. II Physics, c 2, 193b32-32

327. "Non enim mathematicus considerat corpus quod est in genere substantiae, prout pars eius est materia; sed secundum quod est in genere quantitatis tribus dimensionibus perfectum;" De Trinitate, Q. 5, ad 2um.

There is a certain order in which accidents come to the substance, (328) and this order, which implies a priority and posteriority, as does all order, is based on the fact that certain accidents pertain more immediately to the subject than others by reason of the closer conformity which these have to the 'ratio' of that subject and hence function either as a disposition for other accidents or as the reason why others pertain to the subject. (329) E.G. Man's intellect is the reason which explains the presence of the will. (330) Now, with regard to corporeal substances, the first accident is quantity. (331) This is the first accident because it is the property or passion which is in closest conformity with the 'ratio' of such a subject. (332) Because it is corporeal, this substance

328. "Sed accidentia adveniunt substantiae quodam ordine." De Trinitate, Q. 5, art. 3, (circa medium)
329. "quatenus inter ipsa accidentia est ordo, ita quod omnia non aequae immediate conveniunt substantiae, sed unum est dispositio ad aliud, vel ratio, quare unum conveniat subjecto," J a St Th., Curs. Phil., T. II, Q. IX, (Pars IIIa Phil. Naturalis) art. 1, p. 759a 43-46
330. "sicut propriae passionibus, quae inter se habent ordinem, una est ratio, quare altera dimanet, sicut voluntas ratione intellectus," IBID, 448-b4
332. "Ad decimioctavum dicendum, quod quodlibet esse generis vel speciei consequuntur propria accidentia illius generis vel speciei; unde quando iam materia intelligitur perfecta secundum rationem huius generis quod est corpus, possunt in ea intelligi dimensiones, quae sunt propria accidentia huius generis;" St Thomas, De Spiritualibus creaturis, Q. Unica, Art. 3, ad 18um.
331. "Nam primo advenit ei quantitas," De Trinitate, ut supra (328)

is ordained to be extended. Of itself, however, the corporeal substance is not extended, for extension demands parts with extremities, since it is the result of the union of parts joined together by their extremities, (333) and the material substance, considered in itself, lacks parts with extremities. (334) It is quantity which gives such parts to the substance and thus makes it to be extended. This it does, not by being the cause of the entity of the parts, for entitatively these parts are substantial, but, because it is order of parts according to prior and posterior, by taking away the confusion present of parts present in the substance anterior to quantity. (335) Prior to quantity, the substance has parts that are not formally but only radically extended. That is, the substance has parts which are united together according to their totality and

333. "Et probatur, quia extensio partium in toto non est quaecumque unio earum inter se, sed unio penes extremitates tantum, ita quod non uniatur una pars alteri se tota, ita ut in illa penetretur et imbibatur, sicut unio formae cum materia, quae pure substantialis est. Nam si una pars unitur cum alia in ipso toto penetrative et secundum omnem sui partem, non unitur extensive, hoc est una extra aliam." J a S Thoma, Curs. Phil. T. I., (II Pars Logica) Q. XVI, Art. 1, p. 545b5-16
334. "Hoc enim ex vi ipsius substantiae provenire non potest, cum substantia ex se non habeat partes cum extremitatibus, quia extremitates non habentur nisi per indivisibilia, substantia autem indivisibilia non habet ex se, v. g. lineam, superficiem, et puncta, quia haec sunt species propriae quantitatis." *ibid*, p. 545b29-37
335. "Quod ergo asserimus, est, quod quantitas formaliter, ut quantitas est, non constituit partes substantiae quantum ad earum entitatem et intrinsecam rationem, sed quantum ad ordinationem, quae tollit confusionem." *ibid*, p. 543b46-544a5



so that they penetrate one another, but which have the capacity to be so ordered, one outside the other, that they would become formally extended. (336) Quantity formally extends these parts, because, through the indivisibles which are proper to quantity as its species, namely the point, line and surface, it permits a union of parts of the substance only according to the extremities, thus preventing a penetration or union according to totality of these parts. Through this union of parts according to extremities, one part is outside another, touching that other in its indivisible or extremity and hence the body is extended. Since, therefore, quantity is the accident by which the parts of the substance are formally extended, it is the accident that most immediately agrees with the corporeal substance. After quantity come the sensible qualities, actions and passions and motion. (337) All these depend on quantity, not as a principle sustaining them, but as the medium through which they pertain to the substance. (338)

336. "habet tamen partes radicaliter, id est capacitatem ad recipiendum illam ordinationem et distinctionem partium quae sine quantitate manent penetratae et se totis unitae, quod est non habere partes ex tra partes." *ibid*, p. 547a33-39

337. "Similiter autem inter accidentia omnia quae adveniunt substantiae, primo advenit ei quantitas, et deinde qualitates sensibiles et actiones et passionem et motus consequentes sensibiles qualitates." *II Physics*, lect. 3, n. 5 (par. 3)

338. "respondetur, quod quantitas non est principium tamquam radix ad recipiendum accidentia, et ita proprie non est principium quo recipiendi, sed medium, quia videlicet quantitas non est principium substandi, quod pertinet ad rationem subjecti inhaesionis, sed dicitur esse medium recipiendi, quatenus inter ipsa accidentia est ordo, ita quod omnia non aequae immediate conveniunt substantiae, sed unum est dispositio ad aliud, vel ratio, quare unum conveniat subjecto," *J a S Th., Curs. Phil., T. II, (III. Pars Phil. Naturalis) Q. IX, Art. 1, p. 759a35-48*

We Have already seen how sensible qualities depend on quantity, when we discussed the question of whether sensible matter could be abstracted from quantity. (339) With regard to action, passion and motion, all depend on quantity in so far as they require sensible qualities, for it is the sensible qualities that make these three sensible. They can also be said to depend on quantity, because, in the material substance, action, passion and motion take place through contact (340) and contact, i.e. a body touching another, is through quantity.

Since quantity is the first of the accidents that come to the material substance, it is related to all the others as prior to posterior. Now the posterior does not pertain to the understanding of that which is prior to it, for being prior means to be before, and if a thing is before another, it can be understood without that other. (341) Therefore quantity does not depend upon any of the subsequent accidents 'secundum intellectum', since, being posterior to it, they do not enter into the constitution of its nature. Concretely, quantity can be abstracted from sensible qualities and motion, action and passion and therefore the mathematician is justified in his con-

339. vide pp. 252-253

340. "Non accidit ei ex hoc quod movet, sed ex hoc quod movet tangendo: quia movere est agere ad hoc quod aliquid moveatur; id autem quod sic a movente patitur, movetur. Sed hoc quod est agere facit tactu; nam corpora tangendo agunt." III Physics, lect. 4, n. 5

341. "Manifestum autem est quod posteriora non sunt de intellectu priorum, sed e converso: unde priora possunt intelligi sine posterioribus, et non e converso." II Physics, lect. 3, n. 5

sideration of quantity without sensible matter and motion.

It should be noted that the quantity of the mathematician is an abstract quantity, that is, a quantity which is not sensible but intelligible. (342) This is important, for Mansion, apparently confusing physical and mathematical quantity, insists that the latter is sensible, (343) and claims that Aristotle, in refusing to denominate the quantity of the mathematician as sensible, while according this denomination to the objects of physics, is guilty of an abuse of words, since the word 'sensible', as used by Aristotle, is here restricted to 'sensible proprium', whereas it also means 'sensible commune', of which quantity is a type. (344) This position of Mansion arises, as we have said, from a confusion between the quantity that is physical and the quantity that is mathematical. Quantity, 'secundum rem', is a 'per se sensible', not proper but common. It is a 'per se

342. "Intelligibilis vero materia est, quae est in sensibilibus, non in quantum sunt sensibilia, sicut mathematica sunt. Sicut enim forma hominis est in tali materia, quae est corpus organicum, ita forma circuli vel trianguli est in hac materia quae est continuum vel superficies vel corpus." VII Meta., Lect. X, n. 1496

343. Op. cit., chpt. 5, Section 3, pp. 166-170

344. "Dés lors, leur refuser la qualification de "sensibles", quand on les universalisant on les prend comme des déterminations mathématiques, et prétendre par là distinguer celles-ci des objets physiques, qui, eux, auraient nécessairement des attaches avec le sensible, entendez avec les sensibles propres, -c'est manifestement faire un abus de mots." *ibid.*, p. 169.

sensibile', because quantity does effect a difference in the alteration of the sense. (345) Quantity influences the alteration of the sense in so far as it supplies the condition with which the sensible object must be clothed, in order that it be perceived. (346) The external sense perceives things that are extended and hence, were there no extension in the object, there would be no perception by the sense. (347) This influence, however, of quantity on the alteration of the sense is not specificative or distinctive of the sense, but only modifying, i.e. it modifies the action of the proper sensibles, but does not constitute a distinct sense. The reason for this is because quantity is not a proper sensible, which is one that can be perceived 'per se' by only one sense, (348) but a common sensible, that is, one which is perceptible by more than one sense. While color can only be

345. "Quidquid igitur facit differentiam in ipsa passione vel alteratione sensus, habet per se habitudinem ad sensum, et dicitur sensibilis per se." II De Anima, lect. 13, n. 393.
346. "Ratio primae partis est quia sensibile commune ita pertinet ad plures sensus, quod tamen conducit ut res aliqua sentiri possit, ita quod sine illo non possit sentiri, aut nisi per illud modo difficetur, ut tali modo sentiatur, sicut v.g. sine quantitate seu magnitudine non potest res aliqua sensibili et corporeo modo videri." J a St Thoma, Curs. Phil., T. III, Q. IV, Art. 2, p. 112a43-b6
347. "Et tamen ex aliqua parte conducunt per se et necessario ad hoc, ut propria et specificativa objecta in exercitio moveant sensus, sicut dictum est, quia praebent aliquas condiciones vel modificationes, sine quibus non potest corporaliter et sensibili modo ista transmutatio exerceri, quia sine quantitate, figura, motu vel quiete non inveniuntur corporales et sensibiles transmutationes." ibid., p. 113a25-36
348. "Et dicit quod sensibile proprium est quod ita sentitur uno sensu, quod non potest alio sensu sentiri, et circa quod non potest errare sensus," II De Anima, lect. 13, n. 384

seen, sound only heard, sweet and bitter tasted, odors smelled, smoothness or roughness, lightness or heaviness felt, the magnitude can be seen, heard and felt.

Though it is a 'per se sensible', secundum rem, quantity is not the immediate object of the external sense, it is merely a modification of the proper sensible so that this latter can exercise its altering influence on the sense. It is not the immediate object because it is impossible that a potency be moved by a thing except under that formality which is distinctive of the potency. (349) That which formally specifies and distinguishes the sense is the proper sensible, since it is this sensible that is exclusively proper to one sense and not to any other. Hence the modification of the proper sensible which is quantity, is a mediate object of sensation. It moves the potency, not by its own formality, but by being clothed with the formality of the proper sensible. (350) The magnitude is visible, not because it is a magnitude but because it is colored. Likewise it is the object of touch because of its smoothness or roughness, heaviness or lightness, all of which are proper to the tangible. (351) Therefore the common sensible depends, as an object

349. "Ex quo sumitur fundamentum conclusionis, quia impossibile est moveri aliquam potentiam ab aliquo nisi ratione proprii specificativi talis potentiae, siquidem impossibile est, quod specificatum transeat limites et adaequationem sui specificativi."  
J a S Thoma, Curs. Phil., T. III, p. 113b24-30

350 "Ergo ut sensibile commune moveat specificative aliquem sensum oportet, quod non moveat ratione sui, sed ratione sensibilis proprii et induendo rationem formalem illius;" *ibid*, b41-45

351. "Et ideo sensibilia communia non movent sensum primo et per se, sed ratione sensibilis qualitatis, ut superficies ratione coloris."  
Summa Theo., Ia Pars, Q. 78, Art. 3, ad 2um

of sensation, on the proper sensibles. (352) When, therefore, one abstracts from the sensible qualities, which are the proper sensibles, quantity is no longer perceptible by sense, but only by the intellect. Hence it is no longer sensible, but intelligible. But such quantity is not quantity 'secundum rem', but quantity 'secundum intellectum'. And this is the quantity of the mathematician. His consideration does not fall on physical quantity, which is per se sensible, but on abstract quantity, which is quantity separated from sensibility, because it has been separated from sensible matter.

II) Abstrahentium non est mendacium:

If it is proper for the mathematician to abstract quantity from sensible matter and movement, does this not result in a non-conformity between things as they are and the mathematician's concept of them? In reality all lines, points, surfaces, etc., are sensible things, i.e. that have sensible matter, and furthermore are subject to movement. Aristotle himself admits this, for he denies that the mathematical qua mathematical exists. (353) Therefore mathematics is false, since it does not conform to things.

352. "Itaque sicut modificatio seu modus non potest poni seorsum a re, cuius est modus, ita sensibile commune, quod modificat proprium, non potest seorsum a sensibili proprio, cuius est modus, repraesentari, praesertim cum ex istis modificationibus dependeat singularitas sensibilis proprii." J a S Th., Curs. Phil., T. III, p. 114a10-18

353. III Meta., c 2, 998a7-15; XIII Meta., c 2, 1076b13-29: Vide p. 197.

In considering this difficulty, St Thomas answers by saying that the mathematician does not treat his objects other than they are. (354) At first glance this statement appears to be quite contrary to what is an admitted fact—all lines, etc., are sensible lines. To understand his meaning we must first call to mind that the mathematician abstracts quantity, but does not separate it. This is of tremendous importance, for abstraction involves neither the affirmation nor the negation of a connection, while separation involves a definite negation of any connection. (355) Now, in abstracting quantity, the mathematician does not say that it is separated from sensible matter and motion, which is patently false, for abstraction, since it pertains to the first act of the mind, does not involve a judgement, but only the understanding of the essence. <sup>What the mathematician does</sup> ~~What the mathematician~~ does do by abstracting, is to consider one thing and not another. <sup>He considers quantity</sup> ~~He considers~~ quantity, but does not consider sensible matter or motion, neither as to what they are nor as to whether they are connected with quantity. This is possible because quantity, secundum rem, is prior to the other two and hence intelligible without them. Therefore, in treating quantity without sensible matter and motion, the mathematician is not according a

354. "Ad primum igitur dicendum quod mathematicus abstrahens non "considerat aliter quam sit." De Trinitate, Q. 5, Art. 3, ad lum.

355. vide p. 229

consideration to that object, which is not proper to it by reason of its objective independence, quantum ad suam definitionem, from both sensible matter and motion, though it is an incomplete treatment because quantity actually is joined, secundum rem, to both these. But an incomplete treatment is not a false one, unless it be put forth as complete. Abstraction, then, is no lie.

"The holders of the theory of Forms do the same thing, though they are not aware of it; for they separate the objects of physics, which are less separable than those of mathematics." 193b35-37

In connection the mathematician and abstraction, Aristotle observes that the Platonists likewise made use of abstraction, though they were not aware of doing so, but, unlike the mathematician, were guilty of a grave error in their use of this. Before pointing out the error, we should first explain how it happened that the Platonists abstracted without being aware of it.

That the Platonists actually employed abstraction, is firmly grounded on the following fact. The forms of physical things, which are objects of their considerations, are, de facto, forms which have their esse in matter and, therefore, can only be separated from that matter by abstraction, since abstraction is the operation by which the intellect separates things joined together in reality. Their unawareness of using abstraction has its foundation in their



inability to understand how the intellect can separate things that are joined together 'secundum rem'. (356) To them the only possible foundation for a separate consideration of objects was the actual separation of the same objects 'secundum rem'. For example. It was possible for the Platonist to treat "homo universalis" without any reference whatever to "homo individualis", because "homo universalis" was a thing that existed apart from the individual man. In a word, theoretically, the theory of Forms did not recognize such a thing as abstraction, which presupposes a union of things 'secundum rem', but only separation, which is the denial of any union, whereas, de facto, their objects were the result of abstraction, since they were joined with others in reality. This, then, is the explanation of Aristotle's charge that the proponents of the theory of Forms abstracted their objects from matter, but were unaware of doing it.

But putting aside their theoretical error, and concentrating on the objects of their consideration which are, de facto, abstractions, the Platonists erred seriously because they exceeded the limits

356. "Quia enim latebat eum quomodo intellectus vere posset abstrahere  
 "ea quae non sunt abstracta secundum esse, posuit omnia quae sunt  
 "abstracta secundum intellectum, esse abstracta secundum rem."  
 II Physics, lect. 3, n. 6.

of abstraction. Because the individual is not an object of science, and further, because act and not matter is intelligible, they abstracted the forms of physical objects not only from individual sensible matter, but also from common sensible matter. Just as the quantity of the mathematician is an abstract quantity, so too the forms of the Platonists were abstract forms. But this is a grave error, for physical forms are less abstractible than quantity.

Quantity can be abstracted from sensible matter, secundum intellectum, because it does not depend on that matter for its definition. Physical forms, however, are not independent of sensible matter in communi, even secundum intellectum, because such forms are essentially forms of matter. They depend, therefore, on matter for their definition and cannot be abstracted from it without becoming unintelligible.

See } on diff. betw. mode of definition of { Mathem.  
 } } physics  
 } on Subaltern.  
 } on Ignorance.