

Reconstructing Aquinas's Process of Abstraction

Liran Shia Gordon

Abstract: Aquinas's process of abstraction of the particular thing into a universal concept is of pivotal importance for grounding his philosophy and theology in a natural framework. Much has been said and written regarding Aquinas's doctrine of abstraction, yet recent studies still consider it to be 'nothing more than a kind of magic.' This problematic claim is not without foundation, for in trying to understand exactly how this process works, we are constantly faced with an unbridgeable abyss and the repeated vague explanations made by Aquinas. The plain truth is that Aquinas explains what abstraction ought to do and yet, most of the time, he does not explain how it is to be done. This paper intends to show that although Aquinas does not present us with a mechanism for the theory of abstraction, we are nevertheless able to construct a viable mechanism which accords with Aquinas's guidelines. The aim of constructing a working mechanism that corresponds to what Aquinas demands of the process of abstraction is twofold: First, it attempts to extricate Aquinas's doctrine of abstraction from the claims of being a quasi-natural doctrine. Second, a viable process of abstraction which is derived from Aquinian-Aristotelian sources can approach contemporary cognitive problems from a fresh point of view.

Aquinas's theory of intellection and his conception of the *intelligible species* are a constant subject of study and debate. As opposed to the linear historical development of intelligible species by Leen Spruit,¹ Max Herrera uses the historical perspective in order to attain a better understanding of the contribution Aquinas makes to the manner in which we apprehend the act of thinking. In his comparative study, *Arabic Influences in Aquinas's Doctrine of Intelligible Species*,² Herrera draws upon the philosophies of Avicenna and Averroes in order to assess two modern attitudes to Aquinas's theory of intellection: *Representationalism*, that holds that, since the intellect knows its objects only through species which are intermediaries,

¹ Leen Spruit, *Species Intelligibilis: From Perception to Knowledge: Classical Roots and Medieval Discussions*, (Leiden: Brill, 1995).

² Max Herrera, 'Arabic Influences in Aquinas's Doctrine of Intelligible Species', (Dissertation, Marquette University, 2010).

it follows that it knows only representations,³ and the so called *Direct Realism* that maintains that the intellect does possess some knowledge of things.⁴

Returning to the historical context, Herrera explains that the Aristotelian understanding of intelligibles, which holds that they cannot reside in the body which is particular, forced Avicenna and Averroes to develop opposite views. Whereas Avicenna perceives the soul as separate from the body, thereby renouncing the sensual world to preserve the personal identity of the human soul, Averroes, on the other hand, relinquishes the personal identity of the human soul by maintaining that abstractions and intellections are borne by one separate agent which uses humans as its instruments:⁵ 'If however the chief agent is one, but uses many instruments, there is nonetheless one agent even though many instruments are needed

³ Haldane describes representationalism as 'the view that the immediate objects of cognitive acts or states are internal entities... which may or may not stand in some further referential relation to objects and features in the world.' John J Haldane, 'Reid, Scholasticism and Current Philosophy of Mind', in *The Philosophy of Thomas Reid*, (Dordrecht: Kluwer, 1989), pp. 285-304 (p. 287). Herrera categorizes different types of Aquinas's representationalism Herrera, pp. 3-10.: those that are grounded in reality by formal causality Gyula Klima, 'Tradition and Innovation in Medieval Theories of Mental Representation', in *Proceedings of the Society for Medieval Logic and Metaphysics*, (2004), pp. 4-11; F. Van Steenberghen, *Le Thomisme* (Paris: PUF, 1992)., and those who think that such formal causality does not suffice and thus maintain that Aquinas holds to the Augustinian doctrine of divine illumination in order to bridge the gap. Robert Pasnau, *Theories of Cognition in the Later Middle Ages* (New York: Cambridge University Press, 1997); Houston Smit, 'Aquinas's Abstractionism', *Medieval Philosophy and Theology*, 10 (2001).

⁴ According to Owens, Stump and Gilson, human cognition is directed toward real existents by intermediaries whereby we know things. Another view holds that no such intermediaries are needed and that things are indeed conceived directly. Kretzman bases this upon an extended understanding of the phantasm and O'Callaghan upon a distinction between the act of the intellect itself which perceives things directly and its act of conceptualization which results in the concept. Dewan makes a somewhat similar case where he claims that the objects of understanding are extra-mental objects and when these objects as understood are considered, only then can the intellect consider them to be species. See Joseph Owens, *Cognition: An Epistemological Inquiry* (Houston University of St. Thomas, 1992); Eleonore Stump, *Aquinas*, (London: Routledge, 2003); Etienne Gilson, *The Christian Philosophy of St. Thomas Aquinas*, (New York: Random House, 1957); Norman Kretzman, 'Philosophy of Mind', in *The Cambridge Companion to Aquinas*, (Cambridge: Cambridge University Press, 1993); J.P. O'Callaghan, *Thomist Realism and the Linguistic Turn: Toward a More Perfect Form of Existence*, (Indiana: University of Notre Dame Press, 2003); Lawrence Dewan, 'St. Thomas and Pre-Conceptual Knowledge', *Maritain Studies*, 11 (1995); Anthony Kenny, *Aquinas on mind*, (Cambridge: Routledge, 1993).

⁵ Although this is how Averroes was read by the Latins, it is clear from his long commentary that he developed his views so as to claim that the humans do hold within them some individual elements. Richard C. Taylor, 'Improving on Nature's Exemplar: Averroes' Completion of Aristotle's Psychology of Intellect', *Bulletin of the Institute of Classical Studies*, 47 (2004). See also Richard C Taylor, 'Averroes on Psychology and the Principles of Metaphysics', *Journal of the History of Philosophy*, 36 (1998); Edward P Mahoney, 'Aquinas's Critique of Averroes' Doctrine of the Unity of the Intellect.', in *Thomas Aquinas and His Legacy*, (1998), pp. 83-106; Herbert A Davidson, 'Averroes on the Material Intellect', *Viator*, 17 (1986); Deborah L Black, 'Consciousness and Self-Knowledge in Aquinas's Critique of Averroes's Psychology ', *Journal of the History of Philosophy*, 31 (1993).

for it, though perhaps a diversity of operations because of the diversity of instruments.⁶ The need to mediate between these two opposing solutions, that human intellections do in fact originate from the corporeal world and that those intellections are in the private possession of the individual human being, provides an important context to evaluate Aquinas's conception of the intelligible species, both in regard to their role in intellection and to their formation.⁷

Though Herrera's arguments against the Representationalists' view are substantial, his conclusion that 'Aquinas is a direct realist epistemologically, but one must deny that he is a direct realist causally'⁸ concerns only the act of intellection by which the mind thinks its objects. Thus, it is not clear whether the act by which the intellect thinks corporeal objects – just representation or the things themselves – is grounded in an act of abstraction which can genuinely extract a thing's quiddity out of the things themselves.⁹ Peter King claims that Aquinas's process of abstraction simply does not meet the conditions Pylyshyn sets for a transduction of a physical event into a mental-symbolic event.¹⁰ As a result, it is not clear that Aquinas's theory forms a bridge between the Aristotelian claim that all knowledge originates from the senses and that intelligible knowledge and its intellection can be produced by an individual human intellect without giving a substantial account of how abstraction takes place. Any explanation must spell out the manner in which the intellect can grasp the intelligible which resides, though perhaps only in potential, within the phantasm. Without such an explanation, it seems that any kind of synthesis of the views of Avicenna and Averroes is only wishful thinking. It is the purpose of this paper to present such a mechanism that will also respond to King's claims that a process of transduction can in fact occur within Aquinas's process. One should note that it is of no importance whether such a mechanism is in fact what Aquinas had in mind, for the purpose here is just to show that such extraction is possible; just as Euclid's theorem does not have only one original proof but many, all of which affirm the same assertion, so too there may be many different mechanisms which can reach the same conclusion.

⁶ CA, n. 88.

⁷ Herrera, p. 122.

⁸ Ibid. p. 227 .

⁹ Herrera distinguishes between no less than five types of abstractions; however this is undertaken mostly on the conceptual level and does not apply to the mechanism itself. Ibid. pp. 166-74.

¹⁰ Peter King, 'Scholasticism and the Philosophy of Mind: The Failure of Aristotelian Psychology', in *Scientific Failure*, ed. by Tamara Horowitz and Allen I. Janis (Lanham: Rowman & Littlefield, 1994), pp. 109-38.

In order to construct a mechanism that abstracts the quiddities of things from the sense data, we need to examine the formation of the phantasm and the process by which the intellect extracts the quiddity from the sensual. First we will try to understand how the sensual phantasm is prepared for abstraction by the internal senses in a process known as the *illumination of phantasms*; secondly we will examine how the intellect abstracts the whatness of things out of the sensual phantasms by ‘stripping it of its material conditions.’ Thirdly, Pylyshyn’s analysis of transduction will be presented and it will be shown that Aquinas’s theory can explain a transduction of physical events into mental-symbolic events which grounds the production of the intelligible species of sensual things.

A Few Words on the Phantasms

That human knowledge in this life time starts from the senses is one of Aquinas’s more well-known statements.¹¹ Thus our discussion will begin with a few words about phantasms which are the sensual representation of the perceived sense data.¹² Phantasm is ‘a certain movement caused by the senses in the act of sensing.’¹³ Just as ‘the sensing subject is moved by sensible objects, so in imagining, one is moved by certain appearances called phantasms.’¹⁴ Phantasms are not just the copies of things, but ‘one of those dispositions or powers by which things are perceived together with their differences.’¹⁵ Thus, imagination is not just a power that represents the senses in a unified manner but also enhances and perfects it.¹⁶ Phantasia has two functions. First, it "records" the sensual images as phantasms. Second, it has the power to manipulate the phantasms, e.g. a golden mountain. On the one hand phantasms are those from which the intellect abstracts its intelligible species by

¹¹ ‘[A]ccording to its manner of knowing in the present life, the intellect depends on the sense for the origin of knowledge; and so those things that do not fall under the senses cannot be grasped ... except in so far as the knowledge of them is gathered from sensible things.’ (SCG 1.3.3)

¹² See also Dorothea Frede, ‘Aquinas on Phantasm’, in *Ancient and Medieval Theories of Intentionality*, ed. by Dominik Perler (Leiden: Brill, 2001), pp. 155-84; Robert Pasnau, *Thomas Aquinas on Human Nature: A Philosophical Study of Summa Theologiae, 1a 75-89*, (Cambridge University Press, 2002), pp. 278-83.

¹³ SDA §659, §656, DMER §311.

¹⁴ SDA §656.

¹⁵ *Ibid.* §638.

¹⁶ ‘[I]n the imagination there are the forms of sensible things not only as received from the senses, but also transformed in various ways, either on account of some bodily... or through the coordination of the phantasms, at the command of reason, for the purpose of understanding something.’ (STH 2-2.173.2)

which it thinks its objects; on the other hand, any act of thinking of the intellect is made by referring back to the phantasms:

Anyone can experience within oneself that when one tries to understand something, one forms certain phantasms for oneself by way of examples, in which one examines as it were, the thing one is striving to understand.¹⁷

But why is it that the intellect needs to turn constantly toward phantasms? The answer lies in the fact that the objects of the intellect are proportionate to its cognitive power. While the proper object of the angelic intellect is an immaterial thing, the human proper object is material, and thus even though human intellect understands universals, it understands universals through particulars, just as the geometer¹⁸ sketches a specific triangle in order to understand the universal triangle.¹⁹

However, the phantasm as a sensual representation of things is not actually intelligible but only potentially²⁰ so and thus a power is needed in order to turn it into something actually intelligible. This power, the agent intellect, can ‘actualize intelligible things by abstracting the species from material conditions.’²¹ The actualization of the potential intelligibility of the phantasm is an intermittent process²² which strips it of its individuating/material conditions. The phantasms are representations that are based upon sensual data which were received by the senses. Its particularity is a product of the fact that it retains within it a likeness of the material conditions of the thing along with the material manner by which it is received.²³ These representations of the material conditions, although inessential for the thing’s form,

¹⁷ *STH* 1.84.7

¹⁸ ‘an angelic intellect... has as its proper object an intelligible substance separate from body... In contrast, the human intellect... has as its proper object a quiddity or nature existing in corporeal matter. ... Accordingly, the nature ... of any material thing cannot be completely and truly cognized except by being cognized as existing in a particular. But we apprehend the particular through sense and imagination. And so it is necessary, in order for intellect actually to understand its proper object, that it turn toward phantasms so as to examine the universal nature existing in the particular.’ (Ibid.)

¹⁹ *DMER*. 450ai-3

²⁰ ‘[The phantasms] are not actually intelligible. They are, however, potentially intelligible, since in the individual man whose likeness the phantasms reflect it is possible to receive the universal nature stripped of all individuating conditions.’ (*SGC* 2.77)

²¹ *STH* 1.79.3; *SGC* 2.77; *CTH* 1.83; *QDV* 10.6.

²² *SDA*, §700.

²³ ‘[T]he form that comes to us from things... is also a likeness of material conditions... because it is received in a material organ, which receives in a material way; consequently, it retains some conditions of matter.’ (*QDV* 8.11)

make it possible for us to perceive the specific thing as *this* thing and ground the intellect's act of turning toward phantasm: 'It is the phantasms which present these determinate sensible natures to us.'²⁴ Thus, the materiality of the phantasm provides a valuable service for the intellect and its stripping does not mean it is being thrown away. On the contrary, the material conditions must be retained in some manner as indexing knowledge that will serve as a bridge for the intellect to the things it thinks about.

The process by which the phantasm is stripped of its material conditions is a gradual one and thus individuality and universality should not be understood as binary concepts.²⁵ When we speak of material/individuating conditions we must distinguish between two types of individuating conditions: 1. The essential conditioning which individuates the thing itself by the thing's *signate matter*. 2. The accidental conditioning which adds material distortion due to the manner in which the thing is transmitted to the perceiver. An example of the second is the manner in which echo changes the order sound is received and which makes its pin-pointing more difficult. Another example is a broken pole in the water. The phantasm is a representation which originates from the *signate matter* of the thing, however its own specificity does not hold within it the thing's *signate matter* but is a result of the manner by which it is transmitted and received by its organ, i.e., the specificity of the phantasm is accidental.

As a result, any process by which the intellect extracts a thing's quiddity out of the phantasm must first adjust and correct the individuating conditioning of the phantasm. Consequently, the given phantasm which represents the thing according to the plain sense data is held together with a somewhat corrected phantasm or a second order phantasm, that is perceived somewhat like "in" the former phantasm, which represents the thing more adequately, e.g., the corrected pole in the water that our imagination projects into the water (which of course requires the intellect) or, using a more phenomenological correction, the perception of the back of the object which is not provided by the senses.²⁶ This correction is made by the common sense which provides a meta-analysis of the sensual data. Following Aristotle,

²⁴ Ibid. 8.11.

²⁵ '[I]n the sensible thing the species has an extremely material existence, but, in the understanding, a very highly spiritual existence. Hence, it has to pass to this spirituality through certain intermediate levels, inasmuch as it has a more spiritual existence... as it goes higher.' (Ibid. 19.1)

²⁶ '[B]ecause substantial forms in themselves are unknown..., substantial differences are frequently taken from accidents instead of from the substantial forms which become known through such accidents.' (DSC 11.3)

Aquinas distinguishes between proper and common sensibles.²⁷ The proper sensibles are the proper object of the senses. They are accidental qualities of the material thing such as hot and cold, black or white. Common sensibles are accidental forms which are discerned by a comparison between the proper sensibles such as motion or shape. That is why we don't see motion or shape through any of our senses but rather apprehend it through a comparison of the proper sensible by means of the common sense which is an internal organ: 'Consequently, this discerning judgment must pertain to the common sense, to which all sensory apprehensions are conveyed, as to their common terminus.'²⁸ The phantasms are not plain representations of the proper sensible. Common sensibles, which are deduced from the proper sensibles, participate in the manner by which the phantasms are constructed and intensify them. Moreover, such construction of the phantasms grants them not only ordinary depth but also temporal depth which holds the phantasm as the same phantasm, while it changes. As a result the phantasm is quasi-individual, i.e., particular, so far as it signifies an individual thing according to its proper sensibles received accidentally, and at the same time it is quasi-abstract for the common sensibles designate that which lies beneath and hold the thing apart from its immediate temporality.

Illumination of Phantasm

It is only after that the phantasm is constructed by the sensual part that the intellect initiates the act by which it extracts the quiddity of things. This act however, is composed of two primary acts:

It throws light on the phantasm... so by the power of the active intellect the phantasms are made more fit for the abstraction there from of intelligible intentions. Furthermore, the active intellect abstracts the intelligible species from the phantasm, forasmuch as by the power of the active intellect we are able to disregard the conditions of individuality, and to take into our consideration the specific nature, the image of which informs the passive intellect.²⁹

²⁷ *SDA* 3.1; *STH* 1.78.4.

²⁸ *Ibid.*

²⁹ *STH* 1.85.1.

Houston Smit notices that whereas abstraction pertains only to the intellect, illumination of phantasms is a joint act with the particular reason ‘which is [the] highest in the sensitive part...[that] comes in contact with the intellective part so that it participates in something of that which is lowest in the intellective part, namely, discursive reason.’³⁰ This act of illumination prepares the way for the agent intellect so that what is potentially intelligible in the phantasm will turn into actually intelligible.³¹ Although it is actively carried by the cogitative power, it is a combined act of the cogitative power, the imagination and the memory.³² Following Avicenna, Aquinas maintains that the inner senses do not consist only of phantasia and memory but also of the estimative power in animals or the cogitative power in humans. Elaborating on Avicenna’s famous example, Aquinas asks how the sheep knows it should flee when perceiving a wolf approaching. He explains that the examination of the sensual data perceived from the wolf does not contain within it the wolf’s intentions and therefore there is a need for a different power which is capable of discerning intentions – that is the estimative power in animals, which acts according to instincts, or the cogitative power in humans.³³ As opposed to an animal which possesses natural born instincts, human beings acquire their disposition through comparisons³⁴ or, as Kenny explains, ‘by trial and error and association.’³⁵ The estimative/cogitative power originates from within, whether according to

³⁰ *QDV* 14.1, also ‘The first aspect is the agent intellect’s illumining of phantasms.... Through this heightened sensible power, which Thomas terms the particular reason, the agent intellect illumines phantasms, insofar as it produces an ordering of phantasms which captures the proper accidents of a material thing. The second aspect is the agent intellect’s production, by abstraction from the illumined phantasms, of an intelligible form in the possible intellect, a form through which the possible intellect cognizes the quiddity of material things.’ Smit, p. 105. Some scholars, commenting on this passage, claim that it is impossible to see how these two acts can belong to the intellect: ‘I cannot see how to make this illumination/abstraction distinction do any substantial work.’ Pasnau, pp. 450, n.11. Also ‘Thomas himself was misled by the plurality of possible formulations of the one thing into overlooking, in this one instance, the fact that his two images ("illuminate" and "abstract") do not mean two different things.’ Karl Rahner, *Spirit in the World*, (London: Sheed and Ward, 1968), p. 223.

³¹ ‘[T]he cogitative power ..., through its act of preparing the phantasms for the operation of the agent intellect..., makes them actually intelligible and perfective of the possible intellect.’ (*SCG* 2.73)

³² ‘[B]y this cogitative power, together with the imagination and memory, the phantasms are prepared to receive the action of the agent intellect, whereby they are made intelligible in act.’ (*Ibid*, 2.60 also see 2.80) See also A Leo White, ‘Why the Cogitative Power?’, *Proceedings of the American Catholic Philosophical Association*, 72 (1998).

³³ More on this see M.J. Barker, ‘Aquinas on Internal Sensory Intentions’, *International Philosophical Quarterly*, 52 (2012).

³⁴ *STH* 1.78.4; Also: ‘[The cogitative] is aware of a man as this man, and this tree as this tree; whereas instinct is not aware of an individual thing ... but only in so far as this individual thing is the term or principle of some action or passion. Thus a sheep knows this particular lamb, not as this lamb, but simply as something to be suckled; and it knows this grass just in so far as this grass is its food. ... For the purpose of natural instinct in animals is to direct them ... so as to seek and avoid things according to the requirements of their nature.’ (*SDA* §398)

³⁵ Kenny, p. 37.

a fixed disposition or a learned one – that is why Aquinas calls it the particular reason ‘for it compares individual intentions the way the reasoning intellect compares universal intentions.’³⁶ Like the estimative power in animals, the cogitative power can identify intentions within the phantasms. The human being discerns intention through comparisons which act as a particular reason. Using these comparisons, the cogitative power can correct and place the phantasms in a better ordering. Illumination, therefore, does not add or change the phantasms essentially but rather makes them more discernible to the intellect.

But in what manner does the cogitative power consider and order these phantasms? Let’s remember what phantasms are. Aquinas explains that phantasms are a movement of appearances.³⁷ Appearances are nothing other than appearances of colors, sounds, tastes and so forth, i.e., qualities. Qualities of the senses and motion presuppose what Aquinas calls extensive or dimensional quantities such as number, dimension and figures that can be considered apart from sensible matter.³⁸ It is important to distinguish between two types of quantities, extensive/dimensional and intensive/virtual, because these two types of quantities correspond to two modes of comprehension.³⁹ Extensive quantity ‘is measured by many or few objects.’⁴⁰ It is measured by the common sense through a comparison of the proper sensibles which are sensed by the external senses. As measured quantities these are magnitude, distance, time and so forth.⁴¹ Intensive quantity on the other hand ‘is measured by the intensity,’⁴² or putting it more clearly, intensive quantity measures the perfection of a particular thing according to its form.⁴³ How then, does the illumination of phantasms order the phantasms? Phantasms are movements of appearances, i.e. movements of qualities and therefore movements of measurable extensive quantities. The cogitative power compares these moving qualities according to their extensive quantity changes, discerning and gridding

³⁶ *STH* 1.78.4

³⁷ *SDA* §656, §770.

³⁸ ‘[I]t is manifest that quantity is in substance before other sensible qualities are. Hence quantities, such as number, dimension, and figures, which are the terminations of quantity, can be considered apart from sensible qualities; and this is to abstract them from sensible matter.’ (*STH* 1.85.1)

³⁹ *QDV* 8.2.

⁴⁰ *QDP* 1.2.

⁴¹ ‘Magnitude, however, is known by the senses, for it is one of the common sensibles. In a like manner motion... is known insofar as the distance of a magnitude is known. But time is known insofar as the prior and posterior in motion are known. For this reason these three can be perceived by the senses.’ (*DMER* §319)

⁴² *QDP* 1.2.

⁴³ ‘Virtual quantity is distinguished into as many classes as there are natures and forms, whose degree of perfection constitutes all the measure of quantity that they have. ... Thus if a thing is called a being, virtual quantity is considered in it with regard to the perfection of existing; and if it is called sentient, this quantity is considered with regard to the perfection of sensing.’ (*QDV* 29.3)

the phantasms according to their magnitude, motion and their temporal relations – what comes before and what comes after. The result of this process is a quantitative analysis of the phantasm both as a whole, i.e., a thing, and in relation to its parts. We can distinguish between three types of parts. The first regards the proper sensibles such as colors, sounds and tastes which are distinguished by the senses but are now made quantitatively considerable. A second type of parts can be identified according to the different movement areas that can be discerned and distinguished by the common sensibles. We can also consider a third type of parts that considers the sensual elements or the movements according to sensual or movement conditioning. In this way, what is presented to the intellect is a thorough analysis of the phantasm which allows the intellect to consider the phantasm according to different parameters, for instance, it can consider it according to its motion, sweetness or redness, or a combined consideration which considers redness (color) in a distinct area such as the tongue.

But in what way are extensive and intensive quantities related? At first glance it seems as if they have nothing in common, the first is a “material” measurement according to the extension of the corporeal object while the latter is a measurement according to the perfection of the operation of the thing, i.e., it is a measurement of the formal aspect of the thing. If one measures the material aspect of a thing and another its formal aspect, it will be worthwhile to find where these two quantities converge. Intensive quantity as a measurement of perfection, must presuppose the concept of the thing according to which the thing is measured. At least with humans, when we are measuring things, most of the time we are not measuring abstract things (such as the perfection of different types of triangles) but rather particular things, for example this tiger or this man. Now this particular tiger or man which we measure is not the thing itself but its phantasm that is given to us. How do we measure the perfection of the phantasm? We have to compare the perfect tiger and the specific tiger that sits in front of us (the presupposition of the presupposed concept of the tiger that the intellect holds will be dealt with later). As we know, form is the principle of operation of a thing. Therefore we must convert the concept of the tiger to a quantitative representation which represents the quantitative aspect of the act of tiger. In order to visualize this conversion we shall use an analogy. The function $f(x) = x^2$, for example can be converted to a sketch of a parabola. Similarly, the quantitative representation of the act of tiger to its concept is like the sketch of the parabola in relation to its formula. Now that one has a quantitative representation of the act of tiger, one can compare it to the extensive movement of the phantasm (and especially to

the figure of the thing which is the closest to the substantial form of the thing⁴⁴). While the movement of the extensive quantities of the phantasm is based on accidental qualities, the quantitative representation of the act of tiger is derived from the definition of the thing and therefore it is an essential representation of the tiger, or as Aquinas explains, ‘Extensive quantity, as is clear from what has been said, is accidental to knowledge. But intensive quantity is essential to it.’⁴⁵ Now, by putting together the perfect quantitative movement and the imperfect and holding them together, we can determine the perfection of that which is measured, i.e. the phantasm of the tiger, by measuring the deviation of the quantitative representation of the phantasm from the quantitative representation.

Stripping the Material Conditions

Aquinas speaks of two types of abstraction made by the intellect. 1. ‘when the universal is abstracted from the particular, as animal abstracted from man... [according to which] that from which the abstraction is made does not remain; for when the difference of rationality is removed from man, the man no longer remains in the intellect, but animal alone remains.’ 2. ‘when the form is abstracted from the matter [according to which] both the form and the matter remain in the intellect; as, for instance, if we abstract the form of a circle from brass, there remains in our intellect separately the understanding both of a circle, and of brass.’⁴⁶ Whereas the second type of abstraction can abstract out of phantasm, i.e., the circle out of the phantasm of the brass, the first can only abstract out of abstracted concepts, for example, an animal out of man. Since the problem that we are trying to understand concerns the manner by which the intellect abstracts its species out of the phantasms, it is the second type of abstraction that interests us. This is confirmed by Aquinas himself who repeatedly describes the act of abstraction by which the agent intellect actualizes the intelligibility of the phantasms as an act by which the intellect strips the phantasms of material conditions or by

⁴⁴ ‘[O]f all qualities in a thing, it is figure that both follows upon the species and indicates the species. ... [for] just as quantity is the nearest of all the accidents to the substance, so the figure, which is a quality affecting quantity, is nearest to the substantial form. ... It is for this reason that an image, which is an express representation of a thing, is based especially on the figure rather than on the color or something else.’ (*PA* §917)

⁴⁵ *QDV* 20.4.

⁴⁶ *STH* 1.40.3.

considering the thing without its matter.⁴⁷ Moreover, abstraction of the universal out of the particular does not make the thing intelligible to the mind for ‘a thing is actually known because it is immaterial, not because it is universal.’⁴⁸

Instead of examining the thing which is to be abstracted, let us instead concentrate on the thing from which we are to abstract, i.e., matter – not in itself – but rather the abstraction of the concept of matter. Aquinas’s conception of matter and its relation to other issues, such as individuation and form, is of great importance. However, since the objective of this paper is not matter in itself which is beyond the scope of this article, the following is concerned with the abstraction of the concept of matter for ‘it is by no means true that the study of matter is equivalent to the study of the concept of matter.’⁴⁹ Aquinas defines two types of matter:

I call matter designated if it is considered together with the determination of its dimensions, that is, with these or those dimensions. I call it not designated, however, if it is considered without the determination of its dimensions. In this connection, it must be noted that designated matter is the principle of individuation, from which every intellect abstracts inasmuch as it is said to abstract from the here and now. The intellect of the natural Philosopher, however, does not abstract from non-designated sensible matter; for it considers man, flesh, and bone, in whose definitions non-designated sensible matter is included.⁵⁰

When we considered *signate matter*, it seemed as if it was that from which the thing is made. But the above passage tells us something different. Designated matter, i.e., *signate matter* is non-designated matter + ‘determination of its dimensions.’ Furthermore, Aquinas makes it clear that *signate matter* is the thing’s principle of individuation. This principle of individuation which concretizes the thing as *this* thing is that from which the intellect

⁴⁷ ‘Abstraction may occur in two ways: First, by way of composition and division; thus we may understand that one thing does not exist in some other, or that it is separate therefrom. Secondly, by way of simple and absolute consideration; thus we understand one thing without considering the other. Thus for the intellect to abstract one from another things which are not really abstract from one another, does, in the first mode of abstraction, imply falsehood. But, in the second mode of abstraction, for the intellect to abstract things which are not really abstract from one another, does not involve falsehood.’ (*STH* 1.85.1)

⁴⁸ *QDA* 2.ad5

⁴⁹ Ernan McMullin and Joseph Bobik, *The Concept of Matter in Greek and Medieval Philosophy*, (University of Notre Dame Press, 1965), p. 4. Further reading see Stump, pp. 47-50; Pasnau, pp. 391-93; John F. Wippel, *The Metaphysical Thought of Thomas Aquinas: From Finite Being to Uncreated Being*, (Washington DC: Catholic University of America Press, 2000), pp. 296-375.

⁵⁰ *QDV* 2.4.

abstracts non-designated matter. It turns out that *signate matter* is not that from which the thing is made but rather a concept we use in order to designate that which individuates the thing as a *this*.⁵¹

A thing's principle of individuation itself will always remain hidden from us, yet, through its effects which are construed by the senses, we can designate the thing as an individuated thing. From the designation of the thing as an individuated thing, our intellect can abstract a second order concept which treats or considers it not as *this* effect of individuation but as the *whatness* or the conceptual meaning of the act of individuation which individuates a thing as a *this* thing, i.e. non-designated matter. It is not as if there are different types of matter but rather that there are different considerations of matter which represent different considerations of abstraction of the effect of individuation that the senses perceive.⁵² The first order of consideration is a conception that designates that which is the cause for the sensual act as a specific act. These specific acts are not something we need to think about, they are a given, they are those from which thinking starts. Therefore *signate matter* is simply a causal designation which designates that which is the cause of the act of sensation as particular. Common matter or non-designated matter is a representation of *signate matter* which considers *signate matter* according to its act alone or its whatness, i.e., it considers the effect of individuation which is designated by *signate matter* without considering that which specifically engendered that effect. In the same respect, the mathematician considers non-designated matter not as subjected to sensible qualities, i.e., sensible matter but as subjected to quantity, i.e., intelligible matter.⁵³ This intelligibility is 'considered intelligible precisely

⁵¹ This of course refers to that which individuates the thing as a *this*. The concept itself does not designate the matter itself but only designates an abstract. Wippel explains that, in the *De ente et essentia* Aquinas 'writes that it is not matter taken in any way whatsoever which is the principle of individuation but only designated matter (materia designata) ... insofar as it is considered under determined (determinatis) dimensions.' Wippel, p. 358. Weisheipl writes that 'matter is designated "this" or "so much" or "the same amount" precisely as it is understood (intellecta) in reference to some determined quantity.' James A Weisheipl, 'The Concept of Matter in Fourteenth Century Science', in *The Concept of Matter in Greek and Medieval Philosophy*, (Indiana: University of Notre Dame Press, 1963), (p. 153).

⁵² '[I]n one respect matter is sensible, and in another it is intelligible; sensible matter being such as brass and wood and anything mobile, and intelligible matter being what is present in sensible things but not as sensible, such as the objects of mathematics.' (*Meta*. §627)

⁵³ '[T]he mathematician, however, abstracts entirely from sensible matter, though not from non-designated intelligible matter.' (*QDV* 2.6) '[Q]uantity is in substance before other sensible qualities are. Hence quantities, such as number, dimension, and figures, which are the terminations of quantity, can be considered apart from sensible qualities; and this is to abstract them from sensible matter; ... some things can be abstracted even from common intelligible matter, such as "being," "unity," "power," "act," and the like; all these can exist without matter, as is plain regarding immaterial things.' (*STH* 1.85.1)

insofar as something divisible is taken in numbers or in continua,⁵⁴ i.e., as it exists as part of the continuum and not as part of sensual matter -- something which transcends the specificity of discrete things and is common to them all.⁵⁵ The first grade of matter is an effect and product of the act of individuation which represents the cause of the individuated effect as *this* thing. The second grade represents the act which makes a *this* without considering the *this* specifically. The third grade represents the thing as such without considering the act of thing which makes it a *this*.

Instead of finding a way to segment and separate the phantasm from its materiality, we now see that the stripping is not actual stripping but rather represents modes and grades of considerations of the phantasm as a product of action. Here are two examples in which such abstraction takes place. 1. The act of sight: at first the act of sight is considered according to the specific accidental sight which sees specific material things, for example, this tree or house. Then, by considering sight without its specific individuating conditions, sight can be considered not to relate to specific material things but rather to material things in general. Lastly sight can be considered abstracted from matter and then it is the sight which transcends things as such, material or not. 2. Human: The apprehension of a specific man is considered. Then man can be considered not specifically but rather as material man in general. Lastly man can be considered detached from matter, i.e., as humanity which considers man only according to that which transcends any particularity in it.⁵⁶

The Problem of Transduction

⁵⁴ *PA* 1.9.

⁵⁵ '[M]atter is the principle of individuation not only in singular things but also in the objects of mathematics; ... For just as the form of man exists in such and such Matter, which is an organic body, in a similar way the form of a circle or of a triangle exists in this matter, which is a continuum, whether surface or solid.' (*Meta.* §1496)

⁵⁶ 'Humanity understood is only in this or that man; but that humanity be apprehended without conditions of individuality, that is, that it be abstracted and consequently considered as universal, occurs to humanity inasmuch as it is brought under the consideration of the intellect, in which there is a likeness of the specific nature, but not of the principles of individuality' (*STH* 1.85.2); '[T]he concept of humanity includes only those things by which a man is a man, designate matter is excluded or pretermitted, and since a part is not predicated of its whole, humanity is predicated neither of man nor of Socrates. ... Therefore, the term man and the term humanity both signify the essence of man, though in diverse ways. ... Hence, the term man is predicated of individuals. But the term humanity signifies the essence of man as a part because it contains in its signification only what belongs to man insofar as he is man, and it excludes all designation, and so it is not predicated of individual men' (*DEEE* c.2); Also *SCG* 4.81; *CTH* c.154.

Now that we understand how the intellect strips the thing of its individuating matter, we ask how the intellect identifies the phantasm. One might ask the following question: if the illumination which prepares the phantasms for abstraction is based upon an act of comparison, then that leads to a circle for a comparison that presupposes something that it can compare it with. Thus we need to establish some mechanism or process which grounds the intellect's basic atomic knowledge of things that will subsequently allow the comparison explained above. This mechanism Pylyshyn calls the *process of transduction*.

Transduction is a physical process by which a physical event is converted into a mental-symbolic event.⁵⁷ This process must not be circular or incomplete or based upon hidden processes.⁵⁸ Thus it must be independent of the cognitive system⁵⁹ and does not require internal representations.⁶⁰ As a result the process needs to be described in physical language⁶¹ which does not involve mental-symbolic functions.⁶² According to Pylyshyn, the transduction process is primitive and simple making the conversion a non-computation or non-mental-symbolic act and invariable, for example, a thermometer which transforms a physical event into numerical representation.⁶³ If it is variant, that is, non-simple, a process of reduction will be undertaken until simple and independent transducers are found.⁶⁴ The transduction process must supply the cognitive faculty with information that can serve as a basis for the apprehension of similarities and dissimilarities between things as well as regularities.⁶⁵ By

⁵⁷ '[T]he transducer [converts] ... physical events into computational events.' Zenon W Pylyshyn, *Computation and Cognition: Toward a Foundation for Cognitive Science*, (Cambridge: MIT press, 1984), p. 152.

⁵⁸ '[T]he capability of building a general perceptual system would assure us that our assumptions about the transducer are not circular, that transducers of this type do not incorporate hidden, unexplained, cognitive processes. ... It is tempting to posit a process that accomplishes some task ... without realizing that important elements of one's understanding are missing or that the process stated is not mechanically realizable as described.' *ibid.* pp. 170-1.

⁵⁹ 'A transducer is... operating independently of the cognitive system.' *ibid.* p. 154.

⁶⁰ 'The operations of this ... are simply performed... in a manner not requiring the postulation of internal representations.' *ibid.*

⁶¹ '*Transducer Inputs Must ... be described in physics terminology is one of the strongest constraints imposed on what qualifies as a transducer.*' *ibid.* p. 165.

⁶² '[T]he function performed by the transducer cannot be described as a computation, that is, by a purely symbol-manipulation function. ... the transducer fundamentally is a physical process... [,] *primitive* and is itself *nonsymbolic* [and] is not described as carried out by means of symbol processing.' *ibid.* pp. 148-53.

⁶³ 'A transducer is just another primitive operation, albeit one responsive primarily to the environment rather than the cognitive process. Just as one does not generally consider... any other piece of equipment [such as a thermometer] connecting a physical environment to a computer as performing a computation, so a psychological transducer is considered nonsymbolic in its internal operation.' *ibid.* pp. 154-5.

⁶⁴ *Ibid.*

⁶⁵ '[The transducer] should not provide information that could never serve as the basis for a cognitive distinction. ... the output must provide the basis for all potential distinctions that could show up in cognitive

doing that, the transduction process does not only lay the foundation for the mind to grasp reality but also makes it possible for the cognitive faculty to form the categories and laws which apply to physical beings.⁶⁶

Peter King claims that Aquinas's process of abstraction does not provide a solution to the problem of transduction. King understands the transduction process as the removal of the individuating conditions in the phantasm. This, he claims, is a symbolic and non-primitive function which presupposes classificatory knowledge and terms of what is sensed and thus does not fulfill the requirements of the transduction process as described above. Moreover he explains that this will result in presupposing that brute animals possess conceptual categories.^{11 11 11 1167} However, as was seen earlier, the process by which the phantasm is stripped of its material conditions, although it refers to the phantasm, does not act on the phantasm but rather on a concept. As was shown above, '*signate matter* is not that from which the thing is but rather a concept we use in order to designate that which individuates the thing as a *this*' (so also the particular act of sight or the particular human). Thus, the act by which the phantasm is stripped of its material conditions comes only after transduction has taken place resulting in atomic and simple concepts that will be stripped later on of their material conditions and that will be used to form the whatness of the thing, either simple or complex, composed of simple concepts.

Now that King's objection is answered, we will apply ourselves to seeing that transduction can take place (and since it will be shown that transduction does occur, the paper does not elaborate further on King's argument). It is important to note that we are not looking for a conversion based upon the object of the faculty that perceives the object, such as the conversion of the redness of the apple which is perceived into the concept "red", for this is utterly accidental and cannot induce us to form the concept of an apple. What will be shown is that a transduction of simple properties that can base the whatness of *what things are* is possible. This will be done by presenting one example which shows that such transduction is possible.

phenomena ... [and] *must preserve all distinctions present in the environmental stimulation that are also relevant to the explanation of some behavioral regularity.*' *ibid.* p. 158.

⁶⁶ 'Thus the requirement that the transducer function relate both physical and symbolic descriptions is not merely an appeal to keep cognitive science in harmony with physics, ... it arises because an essential part of what is meant when we say something is a physical event is that it can be described in a way that involves the laws of physics.' *ibid.* pp. 169-70.

⁶⁷ King, pp. 118-9.

Aquinas explains that the intellect performs two operations. In the first, the intellect “knows what a thing is” and, drawing on Aristotle, he calls it “the understanding of indivisibles,” which is the comprehension of the quiddity of the thing. By this operation, the intellect forms simple concepts of the thing by understanding their whatness. In the second operation, it joins and divides by forming affirmative and negative statements to which truth value can be assigned. Owens explains that these two operations correspond to two principles and neither the first operation nor the second have priority, for the first operation corresponds to the essence as a unifying principle, whereas the second to the being which is the diversifying principle.⁶⁸ The composition and division should not be taken according to ‘the finished product of the composition’ but rather in a dynamic sense by which ‘the intellect grasps the existential uniting of the matter and form, or subject and nature, into the one single unit.’⁶⁹ Moreover, the indivisibles which are grasped in the first operation (Aquinas's examples of indivisibles are man, animal, or white, etc.⁷⁰), are not indivisible insofar as they are the most basic conceptual building blocks but rather since they appear as a unit in the view of the intellect.⁷¹

In *Super Boethium De Trinitate* Aquinas writes that ‘the second operation has to do with a thing’s being (*esse*), which results from the union of the principles of a thing in composite substances, or, as in the case of simple substances, accompanies the thing’s simple nature.’⁷² It is clear that in considering this operation, Aquinas speaks primarily of composites such as man or a house. However, he is also speaking of simple substances and in such substances the *esse* of the thing is not a product of union but rather accompanies it, i.e., it is rooted in the

⁶⁸ Joseph Owens, ‘Diversity and Community of Being in St Thomas Aquinas’, in *Saint Thomas Aquinas on the Existence of God: The Collected Papers of Joseph Owens*, ed. by John R Catan (Albany: SUNY Press, 1980), (p. 117).

⁶⁹Ibid. p. 119. Also ‘judgment is dynamic and synthesizing and conditioned by time. For that reason what it grasps is expressed and recorded in the synthesis of a proposition and communicated through a sentence.’, see Joseph Owens, *An Interpretation of Existence*, (Milwaukee: Bruce Publishing, 1968), p. 25.

⁷⁰ ‘The intellect, however, has two operations. One of these is called the understanding of indivisibles, and this is the operation by which the intellect forms simple concepts of things by understanding the whatness of each one of them. The other operation is that by which the intellect combines and separates.’ (*Meta.* §1232, also §605); See also *PA*, Forward; *QDV* 14.1; *PH*, Introduction and 1.3; *DSC* 9.

⁷¹ Owens, p. 118.

⁷² *BDT* 5.3: ‘the intellect has two operations. ... these two operations correspond to two principles in things, the first operation concerns the nature itself of a thing, in virtue of which the object known holds a certain rank among beings, whether it be a complete thing, like some whole, or an incomplete thing, like a part or an accident. The second operation has to do with a thing’s being (*esse*), which results from the union of the principles of a thing in composite substances, or, as in the case of simple substances, accompanies the thing’s simple nature.’ *BDT* 5.3. Also ‘the second has reference to being (*esse*) itself which is the base for the “ratio of truth”.’ (*Sent.* 1.19.5.1.7)

first act itself in a more primitive way. Wippel explains that *esse* can be taken in three senses³³³³⁷³ and that at the end it is not clear whether Aquinas ‘simply intend[s] to signify by *esse* the fact that something actually exists (its facticity)? Or does he also have in mind the thing's distinct intrinsic act of being (*actus essendi*)?’⁷⁴ Using Aristotle’s distinction between judgments of existence and judgments of attribution, Wippel concludes that the *esse* that Aquinas refers to in the second operation refers to *esse* as actual existence and not to the intrinsic act of being.⁷⁵ I suggest that a middle position can be taken according to which the *esse* carries with it the judgment of existence of the thing but also that upon which the intellect constructs the quiddity of the thing. It is important to note that that upon which the intellect constructs the quiddity of the thing is not the *actus essendi* of the thing but rather the reaction of the perceiver to the thing which acts upon the perceiver.

Let us consider how it is that a man comes to know what eyeglasses are. There are two ways through which one can come to understand what glasses are. In the first, someone explains to him that glasses assist sight. In the second case, he has to discover what this weird thing is. It is only the second case that is of interest, for the first presupposes that the learner can understand what glasses are by using previously formed concepts. What this man’s intellect encounters are the phantasms of the glasses. He can look at them, taste them and so on but will remain ignorant about what these glasses are. It is only when he puts them on that their operation becomes apparent and becoming apparent is tantamount to being understood. For the act of the glasses itself is something that is seen or not seen and thus is indivisible; and if it is seen its understanding accompanies it, for one does not come to understand that one is seeing, one simply sees. This knowledge is not a quidditative knowledge of the eyeglasses themselves but rather an instrumental knowledge of the manner in which the eyeglasses act on the perceiver: this is that by which he sees within the phantasm itself. Upon such immediate knowledge the intellect makes use of additional knowledge that it possesses. For example, one can distinguish between that by which it sees what touches his eyes – contact lenses – and that which does not – glasses – or those which improve sight and those which only prevent harm – sunglasses.

⁷³ John F. Wippel, *Metaphysical Themes in Thomas Aquinas II*, (Washington DC: Catholic University of America Press, 2007), p. 98.

⁷⁴ Wippel (2000), p. 31.

⁷⁵ Wippel, p. 32.

One may point out a difficulty by saying that it is one thing to grasp glasses which are an instrumental product and another to grasp the nature of a natural thing such as a horse, for one does not wear a horse on one's eyes and perceives them as that by which. To such an objection it can be answered that although we consider a horse or a lion as natural species, it can hardly be claimed that we actually know how to distinguish between them easily and that although some attain essential knowledge of animals and plants, all of us base our categorization upon inessential knowledge. Most of us can point at the Lion, Leopard, Eagle, Dolphin etc., however this is only a fraction of the known species. The truth is that essential knowledge of animals and plants is not something we grasp easily and if a person is asked to explain the difference between a Zebra and a Donkey, he will probably say that the first has black and white stripes, which is certainly not the essential difference between them. Thus, I claim, our mind finds it much easier to classify things according to their instrumentality than according to their natural essential difference which defines their species. Moreover, the understanding that there are natural things as opposed to instrumental things must be arrived at relatively late and only after one learns to discern regularities which allow one to notice that, while instrumental classification adequately defines artificial things, they are only tangential to natural types. Thus the construction of a term which represents a natural type must first be based upon instrumental classification such as that which is edible, that which is load-bearing, etc. Much later and after being compared closely in a non-instrumental manner, one may grasp their essential definition (and this is extremely difficult for 99.9% of us who do not really know what defines a horse). Natural types, though natural, are understood mostly according to the way they have been cultivated to our needs, considered as a threat or used to symbolize attributes in children's books and in culture, as symbols such as being brave or diligent. Thus, things are first perceived according to their instrumentality which is most evident, as being something that we can use, eat, make cloth of, that we need to be afraid of, and onto these classifications we add additional differences which are less evident. As a result, the final determination of the horse according to its ultimate difference, since it is not instrumentally evident, is not the first in the processes by which we classify; it necessitates first the conception of simple instrumental concepts that are formed in a similar manner to the way glasses are understood to be that by which one sees.⁷⁶

⁷⁶ Japola tries to work out the problem of transduction. However I believe she was not really able to explain how it is to be done. For example, she holds that we perceive cats, stones or mother first as simple concepts: 'we first acquire concepts of particular kinds of material beings, such as CAT, STONE, or MOTHER, that we

In sum, the example of the glasses meets Pylyshyn's requirements for a process of transduction (and thus contradicts King's argument that Aquinas's process of abstraction simply does not meet the conditions of transduction). This is a physical process which results in a simple mental-symbolic event that is invariable: seeing or not seeing. It is independent of any innate representation and does not require and act like a thermometer and thus is independent of the cognitive system. It can serve as a basis for an apprehension of similarities and dissimilarities such as was exemplified with contact lenses and eyeglasses as well as the apprehension of regularities: "now I see, now I don't see." And finally, that by which something is seen or not seen is perhaps that by which physical reality is measured and thus forms the basis for any categorization and theoretical examination (perhaps an example of the microscope/telescope would serve our purpose better).

Final Remarks

Many studies have examined Aquinas's theory of abstraction in great detail. The present study has tried to make sense of how abstraction can actually work by presenting a mechanism for 1. the illumination of phantasm, 2. the stripping of the material conditions, and 3. the apprehension of that which grounds the process of abstraction which is instrumental apprehension by which things are seen in the phantasm. I will dare to say that such immediate apprehension of the thing as that-by-which might be responsible for the constitution of the intelligible species as those-by-which the intellect thinks its objects in the phantasms. The two acts of abstractions are responsible for producing more complex concepts, either by stripping the phantasm of its material conditions as a particular material thing, general material thing, or as exclusive of any individual conditions. The act of illumination, which grids the phantasm and its parts according to spatial-temporal relations, supplies the intellect with valuable information as to how to put together the puzzle of operations it understands into a unity of kind which holds 'a thing being one in kind, though made up of discontinuous parts, e.g. the unity of a man, or a house, or even of an army.'⁷⁷ Understanding of the indivisible grounds of the formation of the species of the thing does not mean that that is all we understand. The intellect can deduce from the phantasms accidental forms according to the thing's shape, color and so forth and then attach them to the

cognize by means of our senses.' See Justyna M Japola, 'Fodor and Aquinas', (Dissertation, Georgetown University, 2009), p. 214.

⁷⁷ *SDA* §755.

substantial form. In fact, after one already understands what glasses are, one usually identifies them not according to their act but through their accidental forms. Of course this doesn't guarantee that these are actually glasses, but still, it works most of the time.