

## СТАТЬИ / ARTICLES

### ALEXANDER'S *METAPHYSICS* COMMENTARY AND SOME SCHOLASTIC UNDERSTANDINGS OF AUTOMATA

GEOFFREY S. BOWE  
Istanbul Technical University  
gbove@itu.edu.tr

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**ABSTRACT.** In this article, I argue that Albertus Magnus and Thomas Aquinas read a certain passage of Aristotle's *Metaphysics* on the nature of metaphysical curiosity in a way that is inconsistent with the earlier reading of the same passage by Alexander of Aphrodisias. The passage has to do with Aristotle's use of mechanical automata as a metaphor for kinetic mimesis in his metaphysics. The result of the variant reading of the passage in question is that these Scholastic readings emphasize universal causality as a vehicle of "wonder banishment" in metaphysics at the expense of recognizing the key metaphysical principle that Aristotle is suggesting. Such readings actually turn out to be difficult to maintain with the example of mechanical automata that Aristotle employs. I argue that the absence of the availability of Alexander's commentary to Albert and Aquinas contributes to their variant and inconsistent reading. There are three main parts and a conclusion. Part I discusses the passage from Aristotle's *Metaphysics* in question, which I call the *thaumata* passage, as well as Alexander's commentary on it. Part II discusses the unavailability of Alexander's commentary to Albert, Aquinas and their predecessors. Part III discusses the variant scholastic readings of the *thaumata* passage and how these readings, which take Aristotle's mechanical automata as chance occurrences result in an emphasis on wonder banishment through universal causal reasoning that is inconsistent with the example Aristotle uses in the *thaumata* passage. By way of conclusion I suggest that even had Alexander's commentary been available to Aquinas, he would have understood the passage as more akin to remarks on magic than to metaphysics.

**KEYWORDS:** Aristotle, Alexander of Aphrodisias, Aquinas, Albertus Magnus, *Metaphysics*, Automata, Wonder.

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I. The Alexander Commentary and The *Thaumata* Passage

Thirteenth century Scholastic philosophy has been characterized by some as an era of “wonder banishment,” where “the task of the wise man was 'to make wonders cease.’” Daston and Park emphasize the fact that in the fourteenth century, “Aristotelian wonder at ignorance of causes... largely disappeared from the works of philosophical writers.”<sup>2</sup> If we attend closely to the remarks of Aristotle that give rise to this instinct, we can observe that Aristotle's point is more accurately described as “wonder reversal” than “wonder banishment.” Wonder over the unexplained is reversed, and supplanted by a more enlightened view that would entail wonder over the recognition of the metaphysical necessity of things.

This article is primarily concerned with how Thomas Aquinas and Albertus Magnus understand an introductory passage in Aristotle's *Metaphysics* about the nature of wonder, and as such I begin with an examination of this passage, and its peculiar reference to mechanical devices – *thaumata t'automata*. I then examine how these mechanical devices were understood in Alexander of Aphrodisias' commentary on the passage, and explain what the significance of the mechanical devices is for Aristotle's approach to metaphysical curiosity.

A certain discussion of automata in Aristotle's *Metaphysics*, rarely commented on nowadays, is at the heart of thirteenth century understandings of Aristotelian metaphysical inquiry as wonder banishment. I will heretofore call this passage the *thaumata* passage:

Yet the acquisition of [metaphysical knowledge] must in a sense end in something which is the opposite of our original inquiries. For all men begin, as we said, by wondering [ἀπὸ τοῦ θαυμάζειν] that the matter is so (as in the case of automatic marionettes [τῶν θαυμάτων αὐτόματα] or the solstices or the incommensurability of the diagonal of a square with the side; for it seems wonderful to all men who have not yet perceived the explanation that there is a thing which cannot be measured even by the smallest unit). But we must end in the contrary and, according to the proverb, the better state, as is the case in these instances when men learn the cause; for there is nothing which would surprise a geometer so much as if the diagonal turned out to be commensurable.<sup>3</sup>

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<sup>1</sup> Daston and Park 1998, 125.

<sup>2</sup> *ibid.*

<sup>3</sup> *Metaph.* 983a11-21; tr. Ross 1975. There is considerable difference regarding how to parse the phrase τῶν θαυμάτων αὐτόματα at *Metaph.* 983a12-13. Aquinas' variant translation (In metaph. 66 – discussed below) which influences with Lawson-Tancred's 1998 rendering of the phrase as ‘spontaneous natural wonders’ is refuted by Ross 1975, 123-24 on philological grounds; cf. Primavesi's 2012 emendations. Irwin and Fine's 1995 ‘toys that move spontaneously’ refers to the concept of ‘chance’ without elaborating. Sedley 2010,

The idea of wonder is as an impetus to learning is echoed in Aristotle's *Rhetoric*:

Learning things and wondering [καὶ τὸ μανθάνειν καὶ τὸ θαυμάζειν] at things are also pleasant for the most part; wondering [τῷ θαυμάζειν] implies the desire of learning, so that the object of wonder [τὸ θαυμαστόν] is an object of desire; while in learning one is brought into one's natural condition.<sup>4</sup>

According to Aristotle, wonder causes desire, and learning is a return to our natural condition, or better state, and both are pleasurable. This attitude towards wonder is quite different from Albertus Magnus' description of it as heart stopping fear in “before the appearance of a great prodigy,” or the portrayal of wonder by Adelard of Bath as “next door to horror, the passion associated with monsters, prodigies and other expressions of divine wrath.”<sup>5</sup> Daston and Park explain this attitude, on the part of Adelard at least, as a result of his lack of familiarity with Aristotle's writings, most of whose works were not available in Latin in the 12th century. Perhaps it is not so surprising that at one point Albertus Magnus actually doubted the authenticity of *Metaphysics A*, ascribing its authorship to Theophrastus for he, like Adelard, saw little pleasure in the wonder and curiosity that Aristotle mentions there.

The famous first line of the *Metaphysics*, “All men by nature desire to know,” consistent with the association of wonder and pleasure in the *Rhetoric*, sets the

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20 n. 29, following Sharples 1983, understands Aristotle's ‘αὐτόματον’ as ‘fortuitous’ (cf. Johnson 2005, 95). In *Physics* the word αὐτόματον is, as it is in many Greek texts, something that happens automatically, or with no apparent purpose; cf. Preus 2007, 66; an extensive list in Johnson 2005, 104-5. Translations that appear after the increased availability of Alexander of Aphrodisias' commentary on the *Metaphysics* reveal the true sense of τῶν θαυμάτων ταῦτόματα in the passage. Bessarion 1883 translates, ‘praestigiosis, quae per se ipsa moventur’ (‘deceptive things that appear to be self-moving’). Cousin 1839 translates: ‘et comme on s'émerveille en présence des automates, quand on n'en connaît pas les ressorts’; levers or springs indicate something mechanical. Pierron and Zevort 1840 differ: ‘pour parler des merveilles qui s'offrent à nous d'elles-mêmes, l'étonnement qu'inspirent.’ Saint-Hilaire 1879 offers: ‘on s'étonne devant le spectacle des automates, tant qu'on n'a pas pénétré la cause de leurs mouvements,’ citing Alexander's *in Metaph.* 18.17-19 and *Gen. An.* 734b10-16. Sachs 1999 gives: ‘self-moving marvels’, noting *Mechanics* 848a35-37. Tredennick 1933 gives: ‘marionettes’ without comment or indication of self-motion. Αὐτόματα can mean ‘unexplained coincidences’ and τῶν θαυμάτων ταῦτόματα might indicate ‘unexplained coincidences at which one wonders or marvels’, excising all reference to automatic mechanisms from the *thaumata* passage. However, a mechanical device is certainly what Aristotle means by τὰ αὐτόματα τῶν θαυμάτων in the *thaumata* passage and elsewhere. cf. Bowe, 2017, 54-55.

<sup>4</sup> *Rhet.* 1371A31-34.

<sup>5</sup> Daston and Park 1998, 110.

stage for the importance of metaphysical curiosity of the *thaumata* passage, where we acquire metaphysical knowledge by wondering about things that surprise us, and are inspired to obtain a more natural state of knowing. Once we learn the causes of things or phenomena, we should be surprised if things were different than they are. This much seems straightforward and can rightly be taken as a significant source of the “wonder banishment” approach of thirteenth century Scholasticism, despite the fact that “wonder reversal” and not “wonder banishment” is a more accurate description of its intent. What catches my attention in the *thaumata* passage is the strange example, translated here by Ross as “automatic marionettes.” Here is what Alexander of Aphrodisias says about them in his *Commentary on the Metaphysics*:

For prior to their knowing, they wondered [ἐθαύμαζον] that things could be as they are, but once they had come to know they wondered [θαυμάζουσιν] that things can fail to be as they are. [As examples of] wonders [θαύματα] he mentions the toys [παίγνια], exhibited by the creators of [such] marvels [ὑπὸ τῶν θαυματοποιῶν], that seem to move by their own power [αὐτομάτως κινεῖσθαι], and the solstices, which bring winter and summer.<sup>6</sup>

Again, it is useful to note that Alexander retains the idea of wonder at necessity – viz. Once things are understood, people “wondered [θαυμάζουσιν] that things can fail to be as they are.” My main concern here however, is with the toys that he mentions as an example of wonder reversal. No material remains of these toys are extant, leading to speculation by Schofield that such toys or marionettes were most likely wooden, containing a number of hidden internal mechanisms that would be set in motion from one initial external motion, i.e. the untying or pulling of a string.<sup>7</sup> According to Nussbaum,

The picture which emerges from all these passages is the following: the puppets were attached, marionette-fashion, to strings at each separate limb or joint. A complex mechanism of cables, pegs, or both ensured that, given an initial action of the puppeteer (the untying of a cable, or the freeing of a peg), the puppet performed various complex motions without further direction.<sup>8</sup>

Vitruvius mentions how Ctesibius (fl. 270 B.C.) applies knowledge of pneumatic principles to hydraulic devices, applying them to, “automata which act by the power of enclosed water, to lever and turning engines, and to many other entertaining devices, but principally to water dials.”<sup>9</sup> It is usually thought that the Vi-

<sup>6</sup> *in Metaph.* 18.15-19, [Dooley 1989].

<sup>7</sup> Schofield 2016, 137.

<sup>8</sup> Nussbaum 1976, 148.

<sup>9</sup> *de Arch.*, 8.4.

truvian middle ages starts in the 15th century, but recent scholarship has shown that many copies of his *de Architectura* were available in the thirteenth century and before, and it is not at all unlikely that Albert and Aquinas had seen them.<sup>10</sup> Albert had certainly read Vitruvius, for he makes use of *de Architectura* 6.1 in the Prologue of his *Commentary on Euclid's Elements*.<sup>11</sup> Hero of Alexandria (fl. 62 A.D.) applied these principles to the invention of the aeliopile, and many devices outlined in his *Pneumatica and Automatopoietica*.<sup>12</sup> Lawrence and Drake claim that the first partial translation of the *Pneumatica* was not published until 1501,<sup>13</sup> but Boas had earlier identified a translation by Moerbeke mentioned in a letter of the Paris Faculty of Arts on the death of Aquinas.<sup>14</sup> In the thirteenth century, automatic mechanisms were used for water clocks and medieval marvels of all sorts that adorn the pages of medieval romance literature.<sup>15</sup> We do know of at least two mechanical automata that date to the middle of the thirteenth century, the Virgen de los Reyes androids now housed behind the altar of the *capilla real* of the Seville cathedral; their apparent self motion was accomplished through “the latent energy held in a winding mechanism like a clock or the tongue-and-groove ratchet system.”<sup>16</sup> The fact that these automata are from Seville is perhaps a testament to the commonplace idea that Muslim scholars were far advanced in their possession of and access to Greek mechanical texts. It is worth noting that these androids were operative at the time of Albert and Aquinas, but whether these scholars would have connected them with Aristotle's *thaumata* passage seems unlikely, mainly because they are examples of applied mechanics and not theoretical metaphysics.

Whether wooden and cog driven, or metal and water driven, automata with apparent self-motion certainly did exist in Aristotle's time as well, and the Stagirite refers to them in two other texts, *de Generatione Animalium* and *de Motu Animalium*. The employment of mechanical toys to compare and contrast certain natural processes with artificial ones in these texts differs from their use in the *thaumata* passage, where they are used to discuss metaphysical curiosity that begins with wonder over things of which we do not know the cause. At *De motu an.* 701b2-13 Aristotle compares the movements of animals with those of automatic puppets (τὰ αὐτόματα) and toy wagons, in order to stress that animal parts under-

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<sup>10</sup> cf. Verbaal 2016, 216; Krinsky 1967, *passim*.

<sup>11</sup> Lo Bello 1983, 4, 10.

<sup>12</sup> Hildburgh 1951, 27; Boas 1948, 39.

<sup>13</sup> Lawrence and Drake 1971, 80.

<sup>14</sup> Boas 1948, 40.

<sup>15</sup> Truitt 2015, 8.

<sup>16</sup> Swift, 2015, 55.

go qualitative change when moving, whereas the parts of puppets and toy wagons do not. At *Gen. an.* 734b10-16, Aristotle compares τὰ αὐτόματα τῶν θαυμάτων with the sequence of embryonic development in animals and plants, stating that automatic puppets (τὰ αὐτόματα τῶν θαυμάτων) have a potentiality for motion which is actualized by external forces, which is similar to how semen initiates motion in an embryo. While Alexander's commentary confirms that such toys are what Aristotle had in mind in the *thaumata* passage, it is also important to note that Alexander mentions that the toys in question are exhibited by *thaumatopoi-oi*, which is not something mentioned in the *thaumata* passage. *Thaumatopoi-oi* are however mentioned in Plato's famous cave allegory in the *Republic*. Elsewhere, I have argued at length that one way to read the *thaumata* passage is as a contrastive allusion to the static objects in Plato's famous allegory.<sup>17</sup> Because Aristotle's *thaumata* are moving, it highlights that we gain metaphysical insight once we discover the causes of the motion of his puppets, whereas Plato's metaphysical insight is obtained once we see that our observable world stands in a mimetic relation to realities that are analogous to static puppets made of stone or wood. Aristotle's kinetic mimesis entails understanding that all beings manifest some kind of circular motion. The Unmoved Mover's circular thought is imitated by the circular motion of the planets, allowing for life in the sub-lunar region, where divine circularity is imitated by the life cycles of all living things, including the man's self understanding as a rational animal. Consider Aristotle's remarks in the *de Anima*,

...for any living thing that has reached its normal development and which is unmutated, and whose mode of generation is not spontaneous [ὅσα τέλεια καὶ μὴ πηρώματα ἢ τὴν γένεσιν αὐτομάτην ἔχει], the most natural act is the production of another like itself, an animal producing an animal, a plant a plant, in order that, as far as its nature allows, it may partake [μετέχωσιν] in the eternal and the divine. That is the goal towards which all things strive, that for the sake of which they do whatsoever their nature renders possible.<sup>18</sup>

Whatever their specifics, the devices mentioned in the *thaumata* passage were designed artifacts and substantial beings, with material, formal, efficient and final causes that explain their motion; they do not come to be by chance. Taken as substantial devices, their employment in the *thaumata* passage offers an insight into Aristotle's notion of kinetic mimesis as a key to metaphysical curiosity and understanding. In Part III, I will show that Albert and Aquinas read Aristotle's *thaumata* passage in a completely different way, taking Aristotle's automata as

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<sup>17</sup> Bove, 2017, 55-60.

<sup>18</sup> *De an.* 415a26-b2

chance occurrences or coincidences. This reading has a significant impact on their understanding of the nature of metaphysical inquiry. I maintain that, had they been in possession of Alexander's *Commentary*, where the automata are explicitly identified as toys with makers, they would have thought differently. In Part II then, I will first demonstrate that neither Albert nor Aquinas had access to Alexander's remarks on the *thaumata* passage.

## II. The Availability of the Alexander Commentary from Moerbeke to Bessarion and the Banishment of Wonder in the Thirteenth Century

In this part, I argue that neither Albert nor Aquinas would have read Alexander's commentary on the *thaumata* passage and that, in its absence, their reading of the *thaumata* passage reveals a different approach to wonder in Aristotle's metaphysics. As we shall see in Part III, their idea of wonder banishment requires the explaining away of Aristotle's *thaumata t'automata* as chance occurrences, instead of recognizing the need to inquire into purposefully built mechanical devices.

The idea of the banishment of wonder through causal understanding that the *thaumata* passage seems to suggest is ubiquitous in writers like Aquinas and Albertus Magnus. The *thaumata* passage itself is perhaps newly available, for we know that it is absent from the Arabic translations of the *Metaphysics* known to Albert. The new Latin translation of the *Metaphysics* by Moerbeke, the production of which Aquinas is thought to have a hand in, contains the whole of *Metaphysics A*, whereas Averroes' *Long Commentary on the Metaphysics*, which influences Albert and Aquinas a great deal, begins at 987a6, few pages after the *thaumata* passage. While Albert was aware of peripatetic commentaries, including Alexander's<sup>19</sup> it is unclear how much, if any, of Alexander's commentary on the *Metaphysics* Albert had direct access to. It has been suggested that Albert did not know any of Alexander's commentary directly, but knew of Averroes' references to it. At the same time, Averroes claims to only have had access to two thirds of Alexander's commentary on *Metaphysics A*.<sup>20</sup> Although both Albert and Aquinas offer a commentary on *Metaphysics A*, Albert at one point thought that *Metaphysics A* was not authored by Aristotle; in his commentary on the *Posterior Analytics*, claiming that this part of the *Metaphysics* is not in the Arabic text, and attributes it, along with the famous opening line, "All men by nature desire to know," to Theophrastus.<sup>21</sup> However, as we shall see, Albert comments on *Metaphysics A2* 983a11-21 (the *thaumata* passage) in his commentary on the *Metaphys-*

<sup>19</sup> Tweeten and Baldner 2013, 169.

<sup>20</sup> Walzer 1958, 221; Doig 1972, 35; Kotwick 2016, 30; Altuner 2017, 6; Lo Bello 1983, 4, 10.

<sup>21</sup> in *An. Post.* I,t.2,c.ii; cf. Altuner 2017, 7.

ics, and does not question its authenticity there. We know that Averroes had only seen Alexander's *Commentary on Metaphysics* Λ, and thus would not have been able to avail of Alexander's remarks on the *thaumata* passage. Golitsis compiles a list of 23 *mss.* of the Alexander commentary; of these only 2 – *Parsinus gr.* 1876 and *Marcianus* 255 – are of thirteenth century provenance (i.e. available to Albert and Aquinas), and these were in Constantinople.<sup>22</sup>

In the years following the thirteenth century, we see an explosion of available *mss.* of the Alexander commentary. No doubt Basilios Bessarion had seen it in the 15<sup>th</sup> century, when he translates Aristotle's *thaumata t'automata* as “praestigiosis, quae per se ipsa moventur” - deceptive things that appear to be self-moving.<sup>23</sup> His translation of the *Metaphysics* was completed between 1447 and 1450, by which time, in any case, there were many available copies of Alexander's commentary. Bessarion, titular Latin Patriarch of Constantinople, may have had access to the above mentioned *Parsinus gr.* 1876 and *Marcianus* 255 *mss.* – the earliest known copies mentioned in Golitsis' list. He may also have seen the manuscript of Plato's complete works used by Ficino that Gemistius Pletho gave to Cosimo de Medici before 1462.<sup>24</sup> We may say then with some certainty that neither Aquinas nor Albert appear to have considered Alexander's remarks on the *thaumata* passage, whereas it is certain that Bessarion did, and it is not idle speculation to see Alexander's remarks as informing Bessarion's translation of *thaumata t'automata* as “praestigiosis, quae per se ipsa moventur.”

By contrast with Bessarion's translation, Aquinas reads Aristotle's phrase *thaumata t'automata* as a reference to coincidence, and Albert treats of automata as chance occurrences similar to prodigies or anomalies of nature. In their readings, it would appear that the banishment of wonder is akin to the removal of superstition surrounding such coincidental occurrences through reasoning about causes. It is to these commentaries of Aquinas' and Albert on the *thaumata* passage that I now turn my attention.

### III. Aquinas' and Albert's commentaries On the *thaumata* passage

This part examines how both Aquinas and Albert understood Aristotle's *thaumata* passage as a remark on how metaphysical curiosity over chance or prodigy is banished through causal reasoning. Because both scholars understand Aristotle's automata as chance or coincidence, they see the goal of metaphysical reasoning

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<sup>22</sup> Golitsis 2016, *passim*.

<sup>23</sup> Bessarion, 1883.

<sup>24</sup> Details of my examination of the provenance of *Laur* 59.1 and *Laur* 89.5 at Florence can be found *Bowe*, 2007, 247-8.

about them as the removal of the substantial nature of the automata in the *thaumata* passage. This won't work. Because Aristotle is referring to purposefully designed mechanical devices that serve as metaphors for a metaphysics if kinetic mimesis, these Scholastic interpretations are not suited to the example that Aristotle employs in the *thaumata* passage, and as such they miss the Stagirite's true intent.

Aquinas' commentary on the *Metaphysics* was written at Paris and Naples between 1268 and 1272, with the aid of Moerbeke's translation.<sup>25</sup> Moerbeke is thought to have revised the work of previous translations, in this case most likely *Translatio Anonyma sive Media ms.*<sup>26</sup> Moerbeke's Latin rendering of the relevant part of the *thaumata* passage runs as follows:

Incipiunt quidem enim, ut diximus, omnes ab admirari si ita habent, quemadmodum mirabilia automata [τῶν θαυμάτων ταῦτόματα], nondum speculātibus causum, aut circa solis conuersiones aut diametri non commensurationem.

Moerbeke translates τῶν θαυμάτων ταῦτόματα as “*mirabilia automata*” and as the quotation from Aquinas' *Commentary* below shows, Aquinas read this as “strange chance occurrences,” not unlike Lawson-Tancred's “spontaneous natural wonders” in his 1999 translation of the *Metaphysics*.<sup>27</sup> This is also how Jenkins justifies his translation of Moerbeke's Latin *automata* for τῶν θαυμάτων ταῦτόματα as “automatism of marvelous occurrences.”<sup>28</sup> “*Automata*” in Latin, as in many uses of its Greek counterpart in Aristotle and elsewhere, is simply taken to refer to events whose causes are unknown to us. When Aquinas wrote his commentary on the *Metaphysics*, he had already completed his commentary on the *Physics*, written in Paris in 1268-9, where at one point he writes, “Hence chance, which in the Greek is called ‘*automatum*’, i.e., *per se* vain, occurs in those things which are for the sake of something.”<sup>29</sup> Here is how Aquinas interprets Aristotle's remarks on the beginnings of metaphysical inquiry in the *thaumata* passage:

the first philosophers wondered about less important matters and subsequent philosophers about more hidden ones. And the object of their wonder was whether the case was like that of strange chance occurrences [*automata mirabilia*], i.e., things which seem to happen mysteriously by chance [*idest quae videntur mirabiliter a casu accidere*]. For things which happen as if by themselves [*automata*] are called chance

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<sup>25</sup> Galluzo 2014, 210; Wippel 2007, 250.

<sup>26</sup> Borgo 2014, 23.

<sup>27</sup> Lawson-Tancred 1999.

<sup>28</sup> Jenkins 1997, 234.

<sup>29</sup> in *Phys.* 234.

occurrences. For men wonder most of all when things happen by chance in this way, supposing that they were foreseen or determined by some cause.<sup>30</sup>

Aquinas' interpretation of the *thaumata* passage, dependent on Moerbeke's translation, employs the Latin "*automata*" clearly understood as "chance" in a way that accords with the uses of "αὐτόματα" in the Greek text of Aristotle's *Physics* and elsewhere. Consider just one example from Aristotle's *Physics*:

That which is per se cause is determinate, but the accidental cause is indeterminate; for the possible attributes of an individual are innumerable. As we said, then, when a thing of this kind comes to pass among events which are for the sake of something, it is said to be spontaneous or by chance [ἀπὸ ταῦτομάτου καὶ ἀπὸ τύχης].<sup>31</sup>

The passage quite accurately translates "ἀπὸ ταῦτομάτου" as "spontaneous."<sup>32</sup> In his *Commentary on the Metaphysics*, Aquinas is assuming that Aristotle's use of "*thaumata t'automata*" in the *Metaphysics* is consistent with his use of "*apo t'automatou*" in the *Physics* to refer to spontaneity. Aquinas' commentary on the *thaumata* passage takes Aristotle to mean that the recognition of automata as chance occurrences that are accidental results of the intersection of other purposed results in a banishment of wonder. Hence by way of conclusion to his commentary on *Metaphysics* A, Aquinas says the following:

Therefore, since philosophical investigation began with wonder [ab admiratione], it must end in or arrive at the contrary of this, and this is to advance to the worthier view, as the common proverb agrees, which states that one must always advance to the better. For what that opposite and worthier view is, is evident in the case of the above wonders [mirabilibus], because when men have already learned the causes of these things they do not wonder [non mirantur]... And by reason of the knowledge of [universal causes of things] it reaches this goal, namely, that there should be no wonder [non admiretur] because the causes of things are known [cognitis causis].<sup>33</sup>

Again, it is worth pointing out that Aquinas "banishes" wonder, whereas Aristotle and Alexander merely reverse it. That being said, it is not unreasonable for Aquinas to read the phrase *thaumata t'automata* in the *thaumata* passage as cognate with other passages in Aristotle that employ the phrase *apo tou automatou* to mean spontaneous. This is consistent with the view of Daston and Park that "when medieval Latin writers thought of wonders... they did not imagine universal and stately celestial motions, but... the atypical, the marginal, the strange."

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<sup>30</sup> in *Metaphys.* 66.

<sup>31</sup> *Phys.* 196b28-b31.

<sup>32</sup> See Johnson 2012 and Johnson 2013 for a large catalog of cases where Aristotle and others employ "automaton" and its cognates to mean spontaneity

<sup>33</sup> in *Metaph.* 67-8.

They go on to assert that, “Given this discrepancy between Aristotle's identification of natural wonderfulness with the regular and Latin Scholastic philosophers' identification of it with the unusual, it is hardly surprising that the latter no longer embraced wonder in the way that Aristotle had.”<sup>34</sup> For Aquinas, since metaphysics entails or requires the banishment of wonder, we must seek more mundane explanations for chance occurrences. This is consistent with the way that Aristotle seeks to remove the accidental from metaphysics, put quite precisely by Witmore: “Accidents are thus subjected to a kind of epistemological hygiene in various Aristotelian texts. Unless they are emptied of metaphysical content, readers are told, they offer endless opportunities for confusion.”<sup>35</sup> Thus Aquinas takes the correct approach to the *thaumata* passage on the assumption that the *thaumata t'automata* are accidents of a kind. However, as we see in Part I above, there is clear evidence, from two other texts of Aristotle and the Alexander commentary, that Aristotle has mechanical curios and not marvelous coincidences in mind when discussing wonder in the *thaumata* passage. This is no small matter, for since Aristotle has actual mechanical devices in mind, Aquinas' interpretation of the *thaumata* passage becomes problematic. This is because Aquinas explains chance occurrences as the accidental products of intersecting purposeful causes. We cannot however, account for substantial *thaumata* (i.e. purposely designed machines or toys) in the same way. That is, since Aristotle's *thaumata t'automata* are mechanical devices created for a purpose, understanding them requires looking at the hidden causes of their *per se* being. The reason he connects these devices to metaphysical inquiry alongside celestial motions, is that both celestial phenomena and mechanical toys of this sort employ principles of circular motion and stand in a mimetic relation to the circular thought of the Unmoved mover. In the case of toys, a mechanician or *thaumatopoios* hides the mechanical workings of a device in order to evoke wonder in his audience. Consider the following discussion of the principle of the moving radius from pseudo-Aristotle's *Mechanics*:

Mechanicians [οἱ δημιουργοί] seizing on this inherent peculiarity of the circle, and hiding the principle, construct an instrument so as to exhibit the marvelous character of the device [ὅπως ἦ τοῦ μηχανήματος φανερόν μόνον τὸ θαυμαστόν], while they obscure the cause of it.<sup>36</sup>

Thus the only way to answer the wonder that such *thaumata* inspire in men is to understand the hidden workings of the machine, and the only way to do this is to treat of the purposefully designed mechanism of a determinate thing. The device

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<sup>34</sup> Daston and Park 1998, 116-7.

<sup>35</sup> Witmore 2001, 28.

<sup>36</sup> *Mech.* 848A34-47.

did not come about by accident, but was intentionally made and its cause determinate.

Aquinas, who takes the *thaumata* as coincidences must treat *thaumata* as the result of indeterminate accidental causes. For Aquinas the banishment of wonder caused by Aristotle's *thaumata t'automata* assume that such *thaumata* are "strange chance occurrences" that are the meaningless result of two or more causes that are determinate in terms of their intended results. Aquinas' "strange chance occurrences" as he takes Aristotle to be talking about in the *thaumata* passage, would be the kinds of things that escape the "governance of the stars" due to the accidental causality that accounts for them. As Saif observes, Aquinas,

describes kinds of effects that escape the causality of the heavens: first accidental events, as they have no causes, second acts of the free will that stem from intellect and reason; third, since bodies cannot make an impression on incorporeal things then the celestial bodies cannot directly influence the intellect and will.<sup>37</sup>

It is to the first of these three effects that Aquinas assigns Aristotle's *thaumata t'automata*. However Aristotle's *thaumata* are not accidental events. Rather, they are purposely constructed substances that employ principles of circles, levers and moving radii – and these are mimetic with regard to planetary motion, which is why Aristotle mentions solstices and self moving puppets in the same breath in the *thaumata* passage. In a recent book on the importance of the principle of the moving radius in Greek science DeGroot (2014, 9-10) observes the following:

There are the requirements of rotation of a linear formation of soldiers or any other sort of parade, as well as all manner of theatrical devices, including automata that mimic the movements of animals and humans... Aristotle applies it to the movement of limbs, and from that base in animal motion, to emotional reactions in animals and to embryological development. The principle is also the foundational explanatory trope for differential speeds of heavenly bodies in *On the Heavens* II.<sup>38</sup>

If we take such an assessment into consideration, we can see that "banishment of wonder" over automata that mimic the movements of animals and humans requires knowledge of mechanics, an applied science, something which Aquinas and Albert would place beyond the purview of metaphysics, which to their mind is speculative and universal, and not practical and productive.<sup>39</sup> As Whitney has pointed out, "Aristotle distinguishes theoretical knowledge which deals with necessary being and ends in truth... practical arts... or knowledge expressed in ac-

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<sup>37</sup> Saif 2015, 84.

<sup>38</sup> DeGroot 2014, 9-10.

<sup>39</sup> Whitney 1990, 124, 140.

tion... and productive arts or knowledge by which some product such as a shoe or poem is brought into existence.”<sup>40</sup>

The example of the *thaumata t'automata* in the *thaumata* passage is not about the production of mechanical devices, but rather their ontological status as beings which like the stars and biological creatures, have hidden mechanisms of motion. To disregard this mimesis is to relegate the *thaumata t'automata* to the mere product of a subordinate practical pursuit, one not suitable to metaphysical inquiry. This is not to say that Albert, at least in legend, had no interest in mechanical devices as points of experimentation. Stories abound that count Albert, along with Roger Bacon and Grosseteste, among those natural scientists who were interested in the creation of oracular automata.<sup>41</sup> In one Renaissance account Aquinas is reported to have destroyed Albert's head on suspicion that it was possessed by the devil.<sup>42</sup> These stories aside, it is sufficient to say that from Aquinas' and Albert's points of view such subjects are not that which Aristotle is calling upon in the *thaumata* passage.

Albert uses the word “automata” only three times in his entire extant corpus. All three instances occur in his commentary on the *Metaphysics* and two of these are employed in his discussion of the *thaumata* passage.<sup>43</sup> The third discussion of automata is instructive, in that it is consistent with Aquinas' notion of automatum as “chance occurrence” in his commentary on the *Metaphysics* 66 and commentary on the *Physics* 234. I will call this passage ALB I, and begin with it, since it helps resolve some of the difficult ambiguities in the other two passages.

**ALB I:**

Even some occurrences that are called automata, as if they are intentionally made, result from chance or luck [a casu et a fortuna]; both can be reduced to their efficient cause, and that which occurs by an efficient cause is that which happens naturally; so that which happens as if by chance happens in accordance with nature, and is explained by efficient causes.<sup>44</sup>

From here we can more clearly grasp his intention in the two passages that discuss Aristotle's *thaumata* passage. Both are from *in Metaphys* I.II.10, and labeled here ALB II and ALB III.

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<sup>40</sup> Whitney 1990, 35.

<sup>41</sup> Truitt 2015, 10.

<sup>42</sup> Marr 2004, 205; Collins 2010, 17.

<sup>43</sup> *in Metaphys* I.II.10, my translation.

<sup>44</sup> *in Metaphys*. VII.II.5, my translation.

**ALB II:**

For such wonder [admiratio] about all things is the reason for investigation in that science. Indeed beginners in this science ask whether things are the cause of their own being, like chance occurrences [automata] that is, appearing to exist in and of themselves, and not through the accident of some other cause; and this question is asked by those who still do not examine the cause except in a confused and general way. For they know that chance occurrences [automata] have per se causes, but they do not know the determinate cause that explains the nature and the purpose of these chance occurrences [automata].<sup>45</sup>

What follows these remarks are an extended commentary on the diagonal and some other mathematical remarks, followed by a conclusion that speaks of knowing the causes of automata, and – on an equal footing – the causes of prodigies or portents.

**ALB III:**

From what has been said, then, we infer that the way of doctrine starts in contrast to the way of investigation: since the method in investigation begins from the effect and wonder of one who does not know the cause [ab affectu et admiratione ignorantis causam]. On the other hand, the way of doctrine begins with the assignation of a cause of which one is not surprised [nihil mirantis], because he himself knows the causes of strange occurrences and prodigies [automatum et prodigiorum].<sup>46</sup>

It is noteworthy that Albert reads the wonder banishment he sees in the *thaumata* passage to be about the knowledge of causes of automata and prodigies, for the clearest sense of prodigies the thirteenth century are strange occurrences like (in Albert's own words), “when something in the works of nature happens outside the intention of nature, such as a sixth finger, or two heads on one body, or the absence of a finger.”<sup>47</sup> In Albert's mind, then, metaphysical knowledge of the causes of chance and coincidence remove wonder over automata and prodigies, demolishing superstition and bringing their explanation back under the governance of natural science. Wonders, in short are not the proper subject of metaphysics and must be exterminated by causal reasoning. As Daston and Park claim, “Albertus underscored the irrelevance of wonders in medieval natural philosophy; devoted to universals, regularities, and certain causal knowledge, natural philosophy excluded a priori anomalous and contingent phenomena of uncertain veracity and unknown cause.”<sup>48</sup>

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<sup>45</sup> *in Metaphys* I.II.10, my translation.

<sup>46</sup> *ibid.*, my translation.

<sup>47</sup> *in Phys.* 2.1.17.

<sup>48</sup> Daston and Park 1998, 117.

For Albert, like Aquinas, the *thaumata* passage, which is the source of so many thirteenth century remarks on metaphysics as the banishment of wonder through causal reasoning, is speaking of wonders as coincidences, treating them as examples of superstitious knowledge that metaphysics can banish. Because Albert and Aquinas treat of metaphysical *thaumata* as an extension of physical *thaumata*, their interpretation of the *thaumata* passage is more in line with physical causality than kinetic mimesis. Once we see that Aristotle's *thaumata* are purposeful devices, we see that the Stagirite is trying to articulate that both the celestial and the sub-lunar beings – even mechanical ones – express the metaphysics of circular motion. Kinetic mimesis extends from celestial motion to sub-lunar life to mechanical artifacts. To extend Aristotle's use of *thaumata* in the *thaumata* passage from the idea of spontaneity in the *Physics* assumes automata to be accidental occurrences. Aristotle's metaphysics, at least in the *thaumata* passage, begins with wonder at kinetic mimesis, where automata in the mechanical sense employ and express the same principles of circular motion as the unmoved mover, the planets and living things in the sub-lunar region. Once this is recognized, we would wonder if such metaphysical mimesis failed to present itself. Cases where it does are cases where nature, which always acts regularly or for the most part, has met with an impediment. A purposely built mechanical device is not the same as coincidence resulting from the intersection of two purposeful natural trajectories of kinetic mimesis, but is rather an example of kinetic mimesis. Had Albert and Aquinas recognized Aristotle's *thaumata t'automata* as a self moving toy, they would not have conceived of “wonder banishment” as merely a matter of reducing chance to the intersection of coincident causes.

#### IV. Conclusion

At the outset of this paper I remarked on the claim that the thirteenth century Scholasticism is sometimes characterized by the idea of the banishment of wonder. I have attempted to show that it is highly unlikely that Alexander's commentary was unavailable to Aquinas and Albert, and that time itself guarantees the unavailability of Beassrions' Latin. The result I argue, is that in the case of the *thaumata* passage, Aquinas and Albert miss the significance of Aristotle's remarks on wonder there, which contain an allusion to kinetic mimesis. As such, wonder over automata in the *thaumata* passage represent to them strange chance occurrences, or particularities that need to be explained away by appeal to universal natural causes. Knowledge of mechanical arts, which really entail the application of universal causes to particulars is not consistent with the understanding of metaphysics articulated by Aquinas and Albert. Despite our knowledge of the Seville androids mentioned above, it is unlikely that Aquinas or Albert knew of

them, or even if they did, it seems unlikely that they would have made the connection of such artifacts with Aristotle's *thaumata t'automata*. Even if Aquinas could have availed of Alexander's commentary, he would have read that the *thaumata* in question were made by *thaumatopoi*, which in Latin would be presented as *praestigatoribus* – a kind of magician or sorcerer, a conception that survives into the fifteenth century. Indeed when Ficino translates Plato's cave allegory, the staging of Plato's static puppets is compared to the stages of *thaumatopoi*. Bessarion, as noted above, translates Aristotle's *thaumata t'automata* as “praestigiosis, quae per se ipsa moventur” – deceptive apparently self-moving things. At one point in the *Summa Theologica* Aquinas speaks of the work of demons who confuse us as a form of praestigiosis, “When demons are expressly invoked, they are wont to foretell the future in many ways. Sometimes they offer themselves to human sight and hearing by mock apparitions in order to foretell the future: and this species is called “prestigation” because man's eyes are blindfolded [praestringuntur].”<sup>49</sup>

If Aquinas did have access to Alexander's commentary, it is not at all clear that he would have been comfortable with the *thaumata* passage, for “self moving” machinery would certainly have struck Aquinas as sleight of hand that would require a kind of knowledge more appropriate to magic than to metaphysics. As Eamon (1983, 173) observes, “The association of the mechanical arts with magic is as old, if not older, than history itself. In its most primitive form, magic is fundamentally a kind of technology; the magician is one who attempts to use 'occult forces' to accomplish some specific aim in the physical world.” While at one point in the *Summa Contra Gentiles*, Aquinas attributes wonder to ignorance over the workings of the devices of clever artisans, he immediately goes on to attribute the motion of self-moving statues to magic. At *Summa Contra Gentiles* III.103.9 he claims, “...ingeniosorum artificum opera mira redduntur cum ab aliis non percipitur qualiter operantur [...the works of clever artisans appear wondrous because it is not evident to other people how they are produced]”<sup>50</sup> This claim, which is part of a question on miracles, is immediately followed by a question about how the works of magicians are not solely due to the influence of celestial bodies, and it is here that we get a better sense of how Aquinas thinks of “self moving” machinery:

Now, the power of self-movement is subsequent to the possession of a soul, for it is proper to animated beings for them to move themselves. So, it is impossible for something inanimate to be made able to move itself by the power of celestial bodies. But it

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<sup>49</sup> *Summa*, IIaIIae 95.3, *Res*.

<sup>50</sup> *Summa Contra Gentiles* III.103.9.

is said that this can be done by the arts of magic; that a statue, for instance, can move itself, or even speak.<sup>51</sup>

William of Auvergne's classification of *opera magica*, one that we can easily extend to Thomas, is defined by Marrone (2009,168) in the following manner:

...he divided [*opera magica*] into three subcategories: first the arts underpinning what we would designate as sleight of hand; second, those concerned with the evocation of false appearances by more complicated manipulation of special substances, natural confections and odd apparatuses; and third those relying on the invocation of demons to work even more startling effects.<sup>52</sup>

Aquinas' own belief is that metaphysics studies universal causes, and is not intended for the study of particulars, yet the only way to explain mechanical sleight of hand would be to have knowledge of the workings of mechanical particulars. Ironically, in the very text of Aristotle in which the Scholastic idea of universal causality as a vehicle of wonder banishment is grounded, Aristotle uses curiosity about the particular products of applied mechanical arts as one of three examples of how metaphysical inquiry begins, and wonder reversal is accomplished.

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<sup>51</sup> *Summa Contra Gentiles* III.104.7.

<sup>52</sup> Marrone 2009, 168.

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