

The Translation and Appropriation of Science and Natural  
Philosophy in the Medieval World

Sara Janes

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## **Introduction**

The book was by far the most important method of exchanging knowledge in the ancient and medieval worlds. It was the primary way of conveying information and scholarship from place to place, and from generation to generation.<sup>1</sup> The movement of texts within a unified cultural group, and the translation and transmission of texts from one culture to another, is thus as important a topic as it is complex.

The notion of publication in antiquity was fluid. Texts were not absolute, but were frequently varied during recopying. Whether change was viewed as an error or not depended on whether the text was still useful. It was not uncommon for scholars to make “improvements” to new copies of works by consulting between and combining multiple versions of the original.<sup>2</sup> The geographic movement of individual copies of texts depended almost entirely on personal networks, and did not begin becoming commercialised until the 13<sup>th</sup> century.<sup>3</sup>

The written word has been vital to the continuity and development of scientific thought over the years. Texts representing the scientific tradition pass from one culture or language to another, sparking new thought and development. Perhaps the most striking example is the appropriation of Greek science by Islamic culture, and then of the Graeco-Arabic science by the Latin West.

The translation and transmission of texts from one culture to another is never complete. Countless works will be lost at each stage, and there must have been many works of which no knowledge has reached the present day. However, our modern

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<sup>1</sup> McKitterick, p. 19.

<sup>2</sup> Reynolds and Wilson, p. 28.

<sup>3</sup> McKitterick, p. 17.

scientific tradition would not be what it is today without this transmission of Greek learning through translation and commentary.<sup>4</sup>

Translation is a first and highly important step in the transmission of learning from one culture to another. The creation of translated versions is a more complicated endeavour than simply changing the language: the entire text is re-written, with changes of terminology, intentional omissions or additions, and accidental errors.

The translation and reception of texts are bound together intimately. Translations are made to serve practical purposes or to support new research. Many of the same people are translating, writing commentaries, and writing original works. At many times in the past, the distinctions between these categories have been almost non-existent.

Scientific works have a major impact on the cultures that produce and read them, and thus they act as good indicators for tracing the movement of texts through the world.<sup>5</sup> They are also unique in their status as beacons of learning: scientific texts have been energetically sought out for the knowledge they contain. Historically, scientists have gone to a great deal of effort to obtain new texts written by their contemporaries or predecessors. The readers of texts are instrumental in the transmission of knowledge in a way that writers are not: the desire for new texts is the driving force behind a translation movement.<sup>6</sup>

The appropriation of knowledge and culture is an active process. Once the words have been put into one's own language, the "traditions need to be made one's own" also.<sup>7</sup> Translated texts are but a starting point for the assimilation of new knowledge; translators

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<sup>4</sup> Grant, p. xiii.

<sup>5</sup> Frasca-Spada and Jardine, p. 6.

<sup>6</sup> Frasca-Spada and Jardine, p. 2.

<sup>7</sup> Molland, p. 347.

and readers must create a new context in which to understand the work within their own culture. This frequently necessitates a transformation of the standard interpretation, or even of the text itself.

This process of appropriation is especially relevant to scientific knowledge, which is equally dependent on cultural factors and the natural world. As science is communicated between cultures, some aspects of it must remain constant, while many others will change. For example, different theories about the structure of the universe must account for the same astronomical observations, regardless of the religious or cultural context they originated in.

Individual translations can occur in the absence of widespread need or interest, as when a few works are translated by an interested and sufficiently educated party. However, for a translation movement to occur, the act of translation must become a social rather than an individual concern. There must be widespread active interest in translation, for the sake of access to new knowledge.

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Many branches of modern science have their earliest roots in the thought of the ancient Greeks. This body of knowledge was transmitted, incompletely but more or less continuously, from culture to culture during the middle ages. With each new appropriation, aspects of the theories changed, and new discoveries were added to the corpus of knowledge.

With the fall of the Roman Empire, the body of available literature was narrowed considerably.<sup>8</sup> Rates of literacy dropped precipitously, and Roman libraries were

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<sup>8</sup> Reynolds and Wilson, p. 46.

basically dissolved by the year 400.<sup>9</sup> Any book collections from this time would not have survived, and the texts which we have inherited have undergone numerous transcriptions and translations.

Knowledge of the Greek language was also lost to the West. Though Latin was the common tongue, Greek had been used as a language of scholarship, and most scientific and philosophical texts were written in it. As the ability to understand Greek disappeared, these books were no longer useful and were abandoned. The scholar Cassiodorus urged a mass translation of texts from Greek to Latin, but his plan did not come to fruition, and his works did not have a great effect on posterity.<sup>10</sup>

Some knowledge was summarized in handbooks—a tradition in which works were condensed and condensed again, eventually becoming self-contradictory and far from useful. The writers of handbooks and encyclopaedias frequently had not read the original works that they cited. What knowledge of Greek science there was in the Latin West was more often than not second-hand or third-hand.<sup>11</sup>

Attitudes were mixed towards the Greek science that was rapidly becoming forgotten. It was not rejected outright, but it was seen as outside the realm of Christian learning.<sup>12</sup> The loss of learning in this period was more due to apathy than any sort of censorship. Even the most educated were not interested in reading classical texts, and thus these texts were not reproduced. The knowledge they contained was forgotten in the West.<sup>13</sup>

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<sup>9</sup> Thompson, p. 10.

<sup>10</sup> Reynolds and Wilson, p. 73.

<sup>11</sup> Grant, p. 13.

<sup>12</sup> Grant, p. 3.

<sup>13</sup> Reynolds and Wilson, p. 42.

The Greek language was of course not forgotten in the Byzantine Empire, but many works of science and scholarship were lost. Eastern Christianity was not wracked with the same political upheaval as in the West, but interest in natural philosophy and the sciences waned for many of the same reasons. Works of Greek erudition fell outside the purview of Christian knowledge, and thus could only at most act as a supplement to theology.

What scholarship persisted tended towards nostalgia, rather than the creation and use of new knowledge.<sup>14</sup> Many books were copied and disseminated, but their content tended to degrade from repeated, uninformed copying: scribes who did not understand the content of their work were much more apt to make errors. Many texts containing inaccurate or contradictory information were reproduced and passed along. Their transmission was more due to tradition than to science.<sup>15</sup>

### **The Baghdad Translation Movement**

The city of Baghdad was founded in the year 762 as part of the Caliph al-Mansur's great plan for his empire. Baghdad was to serve as a worthy capital, as a central cultural force to consolidate the `Abbasid caliphs' influence over the Islamic world.<sup>16</sup> Science and natural philosophy saw a revival in this period, as part of the burgeoning Islamic culture. The Caliph al-Ma'mun became a great patron of natural philosophers, employing them to study subjects such as astronomy and mathematics for the benefit of the Caliphate.<sup>17</sup>

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<sup>14</sup> Reynolds and Wilson, 40.

<sup>15</sup> McKitterick, 30.

<sup>16</sup> Gutas, p. 7.

<sup>17</sup> Gutas, p. 58.

Three major shifts in Islamic culture also occurred at this time. First, an agricultural revolution led to increased levels of prosperity, and thus also increased leisure time and learning. Second, paper-making was introduced into the region and quickly became the primary support for all written matter. Third, the creation of an empire centred on Baghdad led to a new mixing of peoples from many different cultures, now linked together by politics and religion: ideas could be spread quickly from one cultural group to another.<sup>18</sup>

One of the most remarkable occurrences of a translation movement occurred in Baghdad, beginning in the late eighth century and lasting until the end of the ninth century. The first works translated were practical volumes of geometry and astronomy, such as Euclid's *Elements* and Ptolemy's *Almagest* (both translated circa 790).<sup>19</sup> The first work of Aristotle's to be translated into Arabic, in 782, was the *Topics*, a practical work of dialectic.<sup>20</sup> All of these works had immediate application to the problems posed by the culture: accurately dividing land and inheritances, winning debates. It was then not long before more theoretical and abstract works were translated in equal number. The atmosphere of scientific discovery and fervour for new knowledge drove translations of even those works with no obvious practical application.

The study and reception of these works was closely tied with their translation, so it should come as no surprise that commentaries and reactions to the newly translated works were written within years. The new scholarship progressively built upon the old, simultaneously with the production of new translations.

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<sup>18</sup> Gutas, pp. 12-13.

<sup>19</sup> Hogendijk, p. 31.

<sup>20</sup> Gutas, p. 61.

Works were translated many times over, as poor-quality translations, which were common, could render the text unreadable. One of the most prominent translators, Hunayn ibn Ishaq, criticized the work of earlier translators for not knowing Greek well enough or for working from faulty original manuscripts.<sup>21</sup> Frequently a corrector, knowledgeable in the subject, would revise the work after the translator had finished. This individual was considered as important an actor in the translation as the translator himself.<sup>22</sup>

Creating a translation of a work was a costly endeavour. First, a copy of the original text must be obtained, which frequently required travel to distant lands. Then, the translator must be paid. Translators were independent professionals, hired by patrons, and required substantial fees for their work.<sup>23</sup> Translations were costly, and thus needed to be sponsored by the most wealthy of Baghdad society; a simple transcription, on the other hand, was more easily affordable. Newly translated materials filtered down in new copies through the ranks of society, reaching a wider audience. These works then spread from Baghdad to other cities, enabling a scientific culture to develop in other parts of the empire.

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During the middle of the ninth century, there was a dramatic increase in the number of transcriptions of Greek works in the Byzantine Empire—so notable that it is frequently referred to as the “Byzantine Renaissance.” A small number of scribes were involved, but among them they created many new manuscripts.<sup>24</sup> This renaissance

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<sup>21</sup> Reynolds and Wilson, p. 50.

<sup>22</sup> Hogendijk, p. 35.

<sup>23</sup> Gutas, p. 139.

<sup>24</sup> Reynolds and Wilson, p. 60.

coincided with two other major developments, which may have acted as causes.

Alterations were made to the standard Greek handwriting script, so it was necessary to transcribe the texts from the old uncial to the new miniscule, for future legibility.<sup>25</sup> These transliterations also coincided with the peak of the Baghdad translations.

The growth of a translation movement in Baghdad meant that there was suddenly a thriving market for Greek manuscripts. After centuries of apathy, these texts were in short supply. Explorers and traders were sent abroad from Baghdad to find desired or undiscovered manuscripts. There are even accounts of a city being sacked so that its books could be plundered.<sup>26</sup>

It is difficult to say whether the Byzantine Renaissance was “caused” by the Baghdad translation movement, or by the change from uncial to miniscule script, but both of these must have been significant motivation for the creation of new manuscript at this time.

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The Baghdad translation movement was a unique case of appropriation of past knowledge, in that the Arabs were essentially reconstructing a previously dead tradition.<sup>27</sup> At this time, no further scientific work was being performed in the Greek language. The tradition was not continued by the Greeks, and Islamic culture claimed it as its own and created a new, but indebted, culture of science and natural philosophy.

Much work still remains to be done to determine the extent of practical adoption of the Greek texts.<sup>28</sup> However, it is clear that the Islamic scientists fully appropriated

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<sup>25</sup> Reynolds and Wilson, p. 53.

<sup>26</sup> Gutas, p. 178.

<sup>27</sup> Ragep, p. xix.

<sup>28</sup> Hogendijk, p. 31.

mathematical methods and theories about the nature of the world. Not long after the first translations became available, scientists began using Greek methods to address entirely new problems.<sup>29</sup>

By the tenth century, the Greek sciences were seen as an unquestioned good. Aristotle and other Greek philosophers were held in the highest regard. This reverence for the past did not preclude later Islamic scientists from being equally respected—as was their due, as their work quickly surpassed the achievements of Greek science.

Science became decentralised throughout the tenth century. The site of the city of Baghdad became much less important to Islamic learning. Knowledge and the accompanying texts travelled across the empire.<sup>30</sup> By the end of the tenth century, essentially all Greek works of science, natural philosophy, and medicine had been translated into Arabic.<sup>31</sup> At this time, the translation activity tapered off, and eventually ceased completely. This was not because of a decline of interest, but simply because there was nothing new to be learned from the translations. The new developments in science which had been building since the time of the first translations continued in the absence of new translations—Arabic scientists progressed much further than the Greeks ever had, especially in terms of mathematics and medicine.

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The earliest works translated in the Baghdad movement were practical works of arithmetic, geometry, logic, and astronomy. It makes sense that these were early concerns, as the benefits of the knowledge they conveyed were readily apparent. By commissioning translations of Greek works on practical matters, one could then reap the

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<sup>29</sup> Hogendijk, p. 44.

<sup>30</sup> Gutas, p. 154.

<sup>31</sup> Lindberg, p. 170.

benefits of using Greek methods. Soon, logical and natural philosophical works were seen to also have practical application. Theological debates began to hinge on issues of cosmology: thus, a translation of Aristotle's *Physics* was of use.<sup>32</sup>

While the first set of translations were of immediately practical texts, it was not long before works on more abstract topics were being translated with equal urgency. Even the most utilitarian text will spark the reader's interest in related subjects, and lead to demand for translations of complementary works. An appreciation for the practical does not preclude an interest in the theoretical, and demonstrations of the value of Greek science encouraged the Arabic thinkers to seek out their knowledge of other aspects of existence.

Translation was an important aspect of the process of science, and became a self-perpetuating activity. The creation of a particular text stimulated new research in its subject, which would then awaken the need for more and better translations.<sup>33</sup> Science and scientists demanded translations, and as their work advanced they demanded a higher quality of translation. It became important that translators understand the content of their work, in order to write about it clearly. Work as a translator became intimately linked to work as a scientist. Not all scientists were translators, but the best translators were scientists, able to understand, correct, and build upon the texts they created.

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The city of Baghdad had adopted many of its administrative policies from the Sasanid Persians, who had been conquered by the Arabs only years earlier. New traditions included the building of libraries and archives, as well as the systematic

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<sup>32</sup> Gutas, p. 72.

<sup>33</sup> Gutas, p. 110.

appropriation of knowledge from foreign cultures.<sup>34</sup> The Sasanid Persians were accustomed to translating works from Greek to Pahlavi, and the `Abbasid dynasty quickly caught up by translating them again to Arabic. There were also many translators at this time working from Greek to Syraic.<sup>35</sup>

The viewpoint expressed by the `Abbasids was not that they were appropriating the learning of another culture, but re-appropriating learning that had belonged to their own historical tradition.<sup>36</sup> The argument made was that this scientific tradition had become part of Greek civilization when Alexander the Great conquered Persia. The Byzantine Christians were not worthy of the Hellenistic tradition, whereas the Islamic world, also formerly part of Alexander's empire, was.<sup>37</sup> The philosopher al-Kindi went so far as to present Greek sciences as being Arab in origin.<sup>38</sup> This was pure propaganda, but it was a propaganda that was accepted as fact by many, and strongly affected the social context of the Baghdad translation movement.

Patronage was another very important aspect of the translation movement. Translators were extremely well paid,<sup>39</sup> and were often sponsored by nobility. As translation was such an important cultural function, acting as patron to a translator became an important status symbol.<sup>40</sup>

Another set of factors affecting the Islamic world's appropriation of foreign sciences are those identified by Berggren.<sup>41</sup> The first was the religion of Islam as a

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<sup>34</sup> Gutas, p. 54.

<sup>35</sup> Sabra, p. 228.

<sup>36</sup> Gutas, p. 60.

<sup>37</sup> Gutas, pp. 84-85.

<sup>38</sup> Gutas, p. 88.

<sup>39</sup> Gutas, p. 138.

<sup>40</sup> Gutas, p. 131.

<sup>41</sup> Berggren, pp. 267-269.

unifying factor for the civilization, particularly the required pilgrimage to Mecca. This led to increased communication between travellers from different parts of the empire. Second, the Arabic language rapidly became a common language for the Islamic world, further enabling communication. A third factor was the tolerance of religious diversity, and thus the appreciation of the works of scholars from a variety of traditions. The fourth factor Berggren gives is the tendency towards fragmentation of political regions. Though the early `Abbasid caliphs hoped to unify a great empire, the tendency was for the Islamic world to fragment into small kingdoms, leading to a fruitful diversification of scientific traditions.

The Baghdad translation movement was a unique development, as the Greek scientific tradition had been essentially dead long before it was appropriated. There were no living people working in the Greek language capable of understanding the Greek scientific texts. The intellectual tradition was essentially beginning again in a new language, rather than being communicated across language boundaries.<sup>42</sup>

### **The Latin Translation Movement in Spain**

The Iberian Peninsula had been part of Islamic civilization since 711, but during the eleventh century it was gradually conquered by Christian forces.<sup>43</sup> At this point, the two civilizations came into close contact, and the Christians began a process of appropriation of Arabic science.

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<sup>42</sup> Hogendijk, p. 37.

<sup>43</sup> Padover, p. 356.

The Islamic city of Córdoba had been established as a Western cultural counterpart to Baghdad, and boasted an impressive library.<sup>44</sup> In part because of the influence of this remarkable city, works of science were widely available.

Though there was frequent conflict between Christian and Islamic forces in this region, there were also great periods of peace. The conflicts triggered a decline of learning in Arabic Spain, including a burning of books at Córdoba.<sup>45</sup> When things were politically stable, there was a great flow of texts between the two cultures.<sup>46</sup> A few scientific and natural-philosophical works had persisted in the Latin West, but these were mostly derivative works, such as Pliny's *Natural History*.<sup>47</sup> All that remained of Aristotle, for example, were fragments.<sup>48</sup> The works of other scientists such as Euclid or Galen had disappeared completely.

Despite having no firsthand knowledge of Plato or Aristotle, scholars in the West had begun a revival of philosophical thought. The growing interest in philosophy and science led to a demand for new Latin texts, and acted as a driving force for a new translation movement.

The most important centre of this translation movement was the city of Toledo, though other cities on the Iberian Peninsula housed translators as well. The most practical works were again translated first, with more philosophical texts arriving shortly after. It is difficult to determine the exact patterns of translation and transcription made by the texts. As during the Baghdad translation movement, multiple translations were made from a

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<sup>44</sup> Burnett (1997), p. 2.

<sup>45</sup> Lindberg, p. 180.

<sup>46</sup> Puig, p. 7.

<sup>47</sup> McKitterick, p. 24.

<sup>48</sup> Lindbergh, p. 223.

single source,<sup>49</sup> and translations frequently went unsigned. As the translations themselves were re-copied, and frequently only these later copies are available, it is “unclear how close the preserved manuscripts are to the original translations.”<sup>50</sup>

Translators at this time frequently worked in teams of two. In many cases, translations proceeded from Arabic to Spanish, and then from Spanish to Latin.<sup>51</sup> The original Greek texts were of course not the only works being translated. The Arabic works forming the body of the most current science were also translated into Latin, and commentated upon. The Latin West’s first encounter with Aristotle was through commentaries on his works. This new knowledge spread through the Latin-speaking world very quickly, particularly to the universities at Paris and Oxford.<sup>52</sup> The works of Aristotle and Ibn Sina were available to the Latin world by 1200, and Ibn Rushd by 1230.<sup>53</sup>

The appropriation of Graeco-Arabic science in the West proceeded rapidly. Original Latin works based on Arabic texts were seen as early as 1145.<sup>54</sup> The Latins were quick to claim the Greek science as part of their heritage, and commonly Latinized the names of Arabic scientists. Ibn Sina, for example, became known as Avicenna; Ibn Rushd as Averroes.

Early translators of Aristotelian philosophy needed to “domesticate” the new knowledge through commentaries and by making changes. They needed not only to translate the language, but also the meaning and cultural context. Parts of Aristotle’s

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<sup>49</sup> Brentjes, p. 204.

<sup>50</sup> Brentjes, p. 206.

<sup>51</sup> Puig, pp. 12-13.

<sup>52</sup> Burnett (1994), p. 46.

<sup>53</sup> Lindberg, p. 216.

<sup>54</sup> Puig, p. 21.

work that fit with the existing Latin-Christian view of the world were kept, and the “errors” needed to be eliminated or explained away.<sup>55</sup>

Aristotelian knowledge in the Latin West was solidified by Albert the Great, who wrote commentaries on all of the Aristotelian texts available to him.<sup>56</sup> These works, and translations of the commentaries of Ibn Sina, also contributed to the popularization of Aristotle, whose works had become mandatory study at the University of Paris by 1255.<sup>57</sup>

In the year 1277, Pope Gregory IX demanded that all “harmful” (non-Christian) materials be purged from Aristotle’s texts.<sup>58</sup> It is worth noting that the Condemnation of 1277 was not an outright rejection of a scientific view of the world, but rather a conditional acceptance. The elimination of aspects that contradicted with the established view of the world was so that the good that remained could be used and understood. Interestingly, this purging never in fact occurred.

Eventually, the cosmology propounded by Aristotle and his commentator Ibn Rushd was fully accepted, being taught at Paris by 1341.<sup>59</sup> However, it was Thomas Aquinas who successfully “Christianized” Aristotelian philosophy. In his writings, he addressed the conflicts between Aristotelianism and Christianity, and was able to reconcile them. Aquinas’ work fully integrates Aristotle’s into the system of Western cosmology, revolutionizing the field.<sup>60</sup>

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<sup>55</sup> Lindberg, p. 224.

<sup>56</sup> Lindberg, p. 229.

<sup>57</sup> Lindberg, p. 218.

<sup>58</sup> Lindberg, p. 217.

<sup>59</sup> Lindberg, p. 241.

<sup>60</sup> Puig, p. 29.

As in Baghdad, the translation movement occurring on the Iberian Peninsula depended highly on the unique cultural circumstances. Here, the Latin West and Islamic civilization were living in close contact, in relative peace. The Islamic world was just ending its golden age of learning and scholarship, and great works of philosophy and science had spread to the edges of the empire. The Latin Christians were entering a period of revitalization of learning, and had only just begun to realize the extent that had been lost with the abandonment of Greek scholarship. The situation was ideal for another translation movement to begin.

One prominent attitude held by the Western Christians was that all the knowledge that could possibly be held about the world had already been revealed, long ago. Truth was a divine gift, but over the years those in the West had gradually lost their knowledge of it. By learning from old traditions and appropriating the knowledge of other cultures, the Latins could come closer to the full extent of truth.<sup>61</sup>

As during the Baghdad translation movement, the sciences were first highly valued for their utility. The earliest translations of this movement were once again works of arithmetic and astronomy.<sup>62</sup> The medieval Christians saw science not as a force in opposition to religion, but as a support to it. The study of science and natural philosophy was justified by its practical benefits: improvements to medicine, navigation using astronomy and geometry, and the creation of new optical devices.

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<sup>61</sup> Molland, p. 348.

<sup>62</sup> Puig, p. 8.

## **The Effect of Translation on Learning**

Translation is often thought of only in a simplistic sense, as a direct transfer of information from one language to another. This perspective, however, is incomplete.<sup>63</sup> The act of translation changes a text in many ways, ranging from errors in copying to intentional editing and rearrangement. With each new language a work is received in, even with each individual translation, the work itself will change, as well as and how it is viewed, understood, and used. This is not a matter of inaccuracy or misinterpretation, but of real developments in philosophical and scientific thought.

Translation, in the ancient and medieval world, was made with practical intent—so that scholars could use and learn from the work in question. The philological ideal of translating as accurately as possible, preserving the original language and intent, is a modern concept, and it would be anachronistic to apply this standard to the work of medieval scholars.

Unintentional errors in translation can cause challenges for later scholars, as the new text may be severely altered. Folkerts gives an example of a serious error caused by scribal mistranscription. The same error was repeated in numerous later copies. A correction, added much later, was the result of careful study and thought.<sup>64</sup>

The translation of a work from one language to another often leads to changes in the meaning of the text, frequently minor, but occasionally major. The particular terms and language used in a text affect how it will be interpreted, and thus also the direction of future research and writing on the subject.

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<sup>63</sup> Ragep, p. xv.

<sup>64</sup> Folkerts, pp. 98-99.

Many of the earliest translations were performed by individuals who were familiar with both of the languages involved, but who were unfamiliar with their subject material. The texts they created were found to be nearly unusable, and the works frequently needed to be re-translated by those better equipped to make sense of them.<sup>65</sup> The best and most used translations were not made by exactly transliterating individual words in a one-to-one correspondence; rather, it was necessary for the translator to understand the meaning of the text and completely re-write it in the new language. Hunayn ibn Ishaq is frequently cited as the first successful translator writing in this fashion,<sup>66</sup> but it rapidly became the only method considered adequate to the task.

Still, no matter what the translator's understanding, slight changes of the terminology used could still lead to changes in the meaning and in the new directions of research. Translations were significantly affected by terms already in use, particularly in the technical fields, as translators were more intent on creating a unified body of science than preserving the original authors' meaning.<sup>67</sup> Kheirandish cites a case where the Arabic term used to translate a Greek text has two potential meanings, and it is the interpretation not corresponding with the original Greek that is used in later readings. This single change in terminology led to a new version of the theory of optics, which formed a new, and successful, body of research.<sup>68</sup>

The "correction" of works undergoing translation was a common practice. Corrective changes of texts have been common in transcription and translation since

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<sup>65</sup> Hogendijk, p. 33.

<sup>66</sup> Lindberg, p. 169.

<sup>67</sup> Sabra, p. 225.

<sup>68</sup> Kheirandish, pp. 231-233.

antiquity.<sup>69</sup> Translators were not concerned with textual accuracy, but with perpetuating useful knowledge. Thus, anything that appeared to be an error should be corrected. These corrections ranged from righting simple factual inconsistencies to re-writing entire segments to make the work fit into the reigning cultural or religious context. The role of the translator was not only to place the work into a new language and make it correspond with prior knowledge, but also to make it easier to understand. In some respects, a translation can be considered to be a new edition of the work.<sup>70</sup>

During the Baghdad period, intentional changes were made to translations in order to serve ideological purposes—supporting the Islamic religion and the `Abbasid government. The translations were financially supported by the ruling class, so it was important that the translations serve their purposes.<sup>71</sup> Similar changes were made in the Latin West, to improve the integration of Aristotelian philosophy with Christian theology. Though differences were apparent on the surface, philosophers such as Roger Bacon believed that there was no serious conflict between the two worldviews. Bacon claimed, instead, that any apparent disagreements arose from “faulty translation or ignorant interpretation,”<sup>72</sup> and that the role of the commentator was to correct those errors.

It is important to remember that these introduced changes were at no point thought of as introducing error to the translations. The material here was thought of in terms of content only, and the task of recovering ancient knowledge was only benefited by adding to that knowledge where appropriate.

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<sup>69</sup> Reynolds and Wilson, p. 28.

<sup>70</sup> Hogendijk, p. 37.

<sup>71</sup> Gutas, p. 146.

<sup>72</sup> Lindberg, p. 46.

The translation of scientific works in the medieval period is intimately connected with the genre of commentary. Its origins are in the *scholia* tradition, where scholars would write comments on the works they read in the margins of the text.<sup>73</sup> The commentary became a popular form of writing as early as late Greek civilization.<sup>74</sup> The genre of commentary was also heavily influenced by the teaching tradition,<sup>75</sup> and so commentaries were frequently used as tools to explain earlier works. A commentary might act as an endorsement of a previous work, or as a refutation.

The commentators of the Baghdad period, and later, believed themselves to be directly improving the texts they wrote on.<sup>76</sup> Scientific knowledge progressed rapidly, so it would quickly become apparent that there were gaps in the knowledge of the world professed by the original authors. It was the responsibility of the commentator to fill in those gaps, to render the text more complete. Likewise, any ambiguities or gaps in the Greek texts and their translations stimulated new studies. Frequently the new work was expressed in the form of a commentary on the original.<sup>77</sup>

The commentaries played a very important role in the transmission of texts. Scholars in the Latin West first encountered Aristotelian thought through the works of Ibn Rushd.<sup>78</sup> His commentaries had such an impact that the Latin philosophers referred to him as “The Commentator,” much as they referred to Aristotle as “The Philosopher.”<sup>79</sup> His work also popularized the form of commentary that addresses the original work phrase by phrase, which became the standard in the later medieval period.

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<sup>73</sup> Reynolds and Wilson, p. 46.

<sup>74</sup> Grant, p. 10.

<sup>75</sup> McKitterick, p. 27.

<sup>76</sup> Hogendijk, p. 39.

<sup>77</sup> Hogendijk, p. 41.

<sup>78</sup> Commonly Latinized to “Averroes.”

<sup>79</sup> Lindberg, p. 218.

A modern concept of intellectual property might disapprove of the tradition of commentary. However, in the ancient and medieval world, “plagiarism” as such did not pose problems. Rather, there existed a longstanding tradition of copying and reusing material with or without giving credit.<sup>80</sup> Commentaries and other derivative works were thus very common.

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Translation movements spread and preserve knowledge, but in some cases might mean that any works which have not been translated will then be lost.<sup>81</sup> At each step, the sum of the choices made by translators determine which works will be available to future scholars, and which will not.

The choices made concerning which works were translated and which were not has had a profound effect on our knowledge today of scholarship and thought in these distant eras. For instance, Ibn Rushd is one of the best known commentators on Aristotle, as his works were extensively translated into Latin and informed the schools which developed into our modern systems of thought. Ibn Rushd drew many of his ideas from, and frequently wrote in response to a predecessor, Ibn Bajja.<sup>82</sup> Ibn Bajja’s works were not translated into Latin, and as a result had very little impact on modern thought.<sup>83</sup> The exigencies of translation—whose works are passed on to other cultures, and whose works are not—can have far-reaching and utterly unpredictable effects.

Although historians of science are very concerned about the importance of putting these works into their proper historical context, it is difficult to wholly treat them outside

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<sup>80</sup> Grant, p. 13.

<sup>81</sup> Reynolds and Wilson, p. 32.

<sup>82</sup> Commonly Latinized to “Avempace.”

<sup>83</sup> Lettinck, p. 65.

of our own context—which has largely been shaped by scientific knowledge as appropriated by the Latin West. It is difficult to address questions about Greek or Arabic thought without viewing the facts through the lens of medieval Latin appropriation. An understanding of the context in which ancient texts were preserved and used will help to elucidate their meaning and impact.

## **Bibliography**

- Berggren, J.L. "Islamic Acquisition of the Foreign Sciences: A Cultural Perspective." Tradition, Transmission, Transformation. Eds. F. Jamil Ragep, Sally P. Ragep, and Steven Livesey. Leiden: E.J. Brill, 1996.
- Brentjes, Sonja. "The Relevance of Non-Primary Sources for the Recovery of the Primary Transmission of Euclid's *Elements* into Arabic." Tradition, Transmission, Transformation. Eds. F. Jamil Ragep, Sally P. Ragep, and Steven Livesey. Leiden: E.J. Brill, 1996.
- Burnett, Charles. "The Introduction of Arabic Learning into British Schools." The Introduction of Arabic Philosophy into Europe. Eds. Charles E. Butterworth and Blake Andrée Kessel. Leiden: E.J. Brill, 1994.
- Burnett, Charles. "The Introduction of Arabic Learning into England." London: The British Library, 1997.
- Folkerts, Menso. "Regiomontanus' Role in the Transmission and Transformation of Greek Mathematics." Tradition, Transmission, Transformation. Eds. F. Jamil Ragep, Sally P. Ragep, and Steven Livesey. Leiden: E.J. Brill, 1996.
- Frasca-Spada, Marina, and Nick Jardine. "Introduction: Books and the Sciences." Books and the Sciences in History. Eds. Marina Frasca-Spada and Nick Jardine. Cambridge: Cambridge University Press, 2000.
- Grant, Edward. The Foundations of Modern Science in the Middle Ages: Their Religious, Institutional, and Intellectual Contexts. Cambridge: Cambridge University Press, 1996.
- Gutas, Dimitri. Greek Thought, Arabic Culture: The Graeco-Arabic Translation Movement in Baghdad and Early `Abbasid Society. London: Routledge, 1998.
- Hogendijk, Jan P. "Transmission, Transformation, and Originality: The Relation of Arabic to Greek Geometry." Tradition, Transmission, Transformation. Eds. F. Jamil Ragep, Sally P. Ragep, and Steven Livesey. Leiden: E.J. Brill, 1996.
- Kheirandish, Elaheh. "The Arabic "Version" of Euclidean Optics: Transformations as Linguistic Problems in Transmission." Tradition, Transmission, Transformation. Eds. F. Jamil Ragep, Sally P. Ragep, and Steven Livesey. Leiden: E.J. Brill, 1996.
- Lettinck, Paul. "The Transformation of Aristotle's "Physical Philosophy" in Ibn Bajja's Commentaries." Tradition, Transmission, Transformation. Eds. F. Jamil Ragep, Sally P. Ragep, and Steven Livesey. Leiden: E.J. Brill, 1996.

- Lindberg, David C. The Beginnings of Western Science: The European Scientific Tradition in Philosophical, Religious, and Institutional Context, 600 B.C. to A.D. 1450. Chicago: University of Chicago Press, 1992.
- McKitterick, Rosamond. "Books and Sciences Before Print." Books and the Sciences in History. Eds. Marina Frasca-Spada and Nick Jardine. Cambridge: Cambridge University Press, 2000.
- Molland, A. George. "Roger Bacon's Appropriation of Past Mathematics." Tradition, Transmission, Transformation. Eds. F. Jamil Ragep, Sally P. Ragep, and Steven Livesey. Leiden: E.J. Brill, 1996.
- Padover, S.K. "Muslim Libraries." In The Medieval Library. 1939. New York: Hafner Publishing Company, 1957.
- Puig, Josep. "The Transmission and Reception of Arabic Philosophy in Christian Spain (until 1200)." The Introduction of Arabic Philosophy into Europe. Eds. Charles E. Butterworth and Blake Andrée Kessel. Leiden: E.J. Brill, 1994.
- Ragep, F. Jamil. Introduction. Tradition, Transmission, Transformation. Eds. F. Jamil Ragep, Sally P. Ragep, and Steven Livesey. Leiden: E.J. Brill, 1996.
- Reynolds, L.D. and N.G. Wilson. Scribes and Scholars: A Guide to the Transmission of Greek and Latin Literature. 2nd ed. Oxford: Clarendon Press, 1974.
- Sabra, A. I. "The Appropriation and Subsequent Naturalization of Greek Science in Medieval Islam: A Preliminary Statement." History of Science 25 (1987): 223-243.
- Thompson, James Westfall. The Medieval Library. 1939. New York: Hafner Publishing Company, 1957.