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(*b*. Cremona, Italy, *ca*. 1114; *d*. Toledo, Spain, 1187),

translation of scientific and philosophical works from Arabic into Latin.

Gerard of Cremona was the most prolific translator of scientific and philosophical works from Arabic in the Middle Ages. He also has been credited with a few "original" works in the same fields, although these attributions are less certain. Through their abundance, subject matter, and quality, Gerard's translations made a decisive contribution to the growth of medieval Latin science. The impact of his work was felt well into the early modern period.

Life. Although Gerard's birth in Cremona is virtually certain, the site of his death continues to be disputed between Toledo, where he worked for the major part of his life, and Cremona, where C. A. Nallino, as recently as 1932[1] (followed by George Sarton), argued that he died. The dispute turns on two bits of evidence. The first, apparently contemporary, is a short eulogy inserted in manuscripts after the list of Gerard's translations compiled by his companions shortly after his death. In this eulogy the last distich runs as follows:

Hunc sine consimili genuisse Cremona superbit Toleti vixit, Toletum reddidit astris.[2]

Nallino argues that the final clause merely implies that Gerard, by his works, "extolled Toledo to the stars." This interpretation, however, forces inadmissible syntactical contortions upon the distich, which is of parallel construction. Toletum, like Cremona, is a nominative and the grammatical subject of the clause it introduces. Hence, the meaning of "Toletum reddidit astris" must be that the city of Toledo returned this illustrious man to the stars.

The second piece of evidence is a statement, dating from more than a century after Gerard's death, by the Italian chronicler Franciscus Pipinus,[3] a Dominican friar who wrote about 1300 and died in 1316. Pipinus asserted that Gerard was buried in the convent of Santa Lucia in Cremona, to which he had bequeathed his library. The sources invoked by the eighteenth-century scholar Francisco Arisi in his *Cremona literata* (1702)[4] testify that in his time there was absolutely no trace of Gerard's library in Cremona. Taking into consideration the eulogy and the fact that Pipinus never stated that Gerard actually died in Cremona, a plausible supposition would be that Gerard's body was returned to Cremona from Toledo to be reinterred, and that some kind of arrangement concerning his estate benefited a monastery in his native Cremona.

For fürther details concerning Gerard's life, as well as his activity as a translator in Toledo, the interpretation of manuscript evidence remains *grossomodo* where it was left by B. Boncompagni (1851) and F. Wüstenfeld (1877)[5]. The principal evidence is a document in three parts, found inserted at the end of some copies of Gerard's translation of Galen's *Tegni* with the commentary of 'Ali ibn Rid wan. This document contains a short biography, a list of seventy-one works translated by Gerard, and the eulogy. An additional piece of evidence, important for the insight it provides into Gerard's intellectual interests and his way of life in Toledo, was added to the dossier by V. Rose in l874[6]. In his *Philosophia*, the English scholar Daniel of Morley, who traveled to France and Spain in the late twelfth century, gives a detailed account of his lively encounter in Toledo with Gerard (whom. incidentally, he calls Gerard of Toledo) while attending Gerard's public lectures on Abū Ma'shar's *Great Introduction to the Science of Astrology*.[7]

Traditional interpretation has attributed all three parts of the biobibliography to Gerard's companions (*socii*) in Toledo. Although the bibliography may confidently be attributed to the *socii*, as the biography states,[8] there is evidence internal to the *vita* that intimates it was not drafted by the companions. Furthermore, the bibliography contains certain inferences in its manuscript transmission to suggest that at one time it existed independently. When it is accompanied by the biography, the link between the two is marked by a *vero* inserted in the title of the list ("Haec vero sunt nomina librorum quos transtulit"); this *vero* is absent from the title when the list appears independently, as in Oxford, MS All Souls 68, fol. 109,[9] and also in the labeling of the several partial lists, such as Ashmole 357, fol. 57v. But it is mostly the wording of the biography that raises doubts. It speaks of the authors of the list in the third person and in the past tense (*per socios ipsius diligentissime fuerunt connumerata*), and indicates the place in the corpus of Gerard's writings where this list has been appended: the end of Galen's *Tegni*, the last of his translations (*novissime ab eo translati*). In the original list without the biography, it should have been obvious where the list had been appended, without a need to specify it. The precision given by the biography sounds like the justification for having moved it from its original place, and the mention of Galen's *Tegni* reinforces this impression. Later, the vita recalls that it was the love of the *Almagest*, which he knew was not available in Latin, that led Gerard to Toledo (*Toletum perrexit*): "there [*ubi*], seeing the abundance of books in Arabic on every subject… he learned the Arabic language, in order to be able to translate. . . ." Also at the end of the vita and introducing the list of translations is the statement "These are the titles of the books translated by Master Gerard at Toledo."

These two citations indicate that the *vita* probably was not written in Toledo but more likely in Cremona, where Pipinus found it and transcribed portions of it in the late thirteenth century. This assessment clarifies the apparently contradictory passage at the beginning of the biography that praises the value of fame and simultaneously depicts Gerard as so humble that he refrained from signing his translations. Certainly this pompous exordium did not originate with the *socii*, who knew Gerard better. According to the discussion with Gerard reported by Daniel of Morley, Gerard was far from humble: "Ego qui loquor rex sum… Cum vero ironice interrogarem ubi regnaret, respondit. in animo, quia nemini mortalium servirem."[10] . In describing the translations, the *vita* characterizes the list as complete (*cuncta opera ab eo translate*) and summarizes it by following *ad litteram* the categories mentioned in the list at the opening of each group. This procedure suggests imitation and exaggeration. The eulogy is so closely patterned on the *vita* that the variants offered by the manuscripts of the eulogy can be selected from the *vita*. Of the two readings, *spirituali* and *spiritualis*, offered by the manuscripts in the third line of the eulogy Wustenfeld chose the wrong one, *spiritualis*. The *vita* was stating clearly: *Carnis desideriis inimicando soils spiritualibus adhaerebat*. In Wüstenfeld, the corresponding line in the eulogy reads *Voto carnali fuit hostis spiritualis [applaudens …]*, where *spirituali applaudens* is obviously the correct reading.

Both textual and biographical clues reinforce the conviction that the *vita* could not have been written by Gerard's associates. This conclusion rests primarily on the absence of Gerard's signature to his translations and on the depiction in the *vita* of Gerard's activity in Toledo. In both cases, the *socii*, appear to be denying themselves credit they might legitimately claim in the choice and work of the translations. A simple listing of the translations, probably included in the original document before the biographer's intervention, would not be subject to these difficulties of interpretation.

The date of Gerard's move from Italy to Toledo and the number of years he devoted to translations also are uncertain. The *vita* stresses that Gerard completed his education in the schools of the Latins before going to Toledo, but it also implies that he moved there very shortly afterward. Since there is no evidence that Gerard devoted to theology the many years necessary for a degree, one may estimate that his stay in the Western schools lasted until he was twenty-five or, at most, thirty years old. Thus, he must have reached Toledo by 1144 at the latest.[11] This would give him some forty-three years of activity in Toledo—a reasonable estimate that also renders his enormous output more credible.'[12]

The only later date in his life that has hitherto been taken for granted is the year 1175, in which he was thought to have completed the translation of Ptolemy's *Almagest*.[13]But this date seems suspect: he would have taken more than thirty years to complete the translation of the work for which he had moved from his native country, despite the help he received with this translation from the Mozarab Galib (Galippus Mixtarabe). The date of 1175 is attested only for the transcription made at Toledo by Thaddeus of Hungary (one of Gerard's associates?) of the text of the *Almagest*; it does not follow that Gerard completed it then. On the contrary, as V. Rose has observed,[14] the use of native Spaniards as collaborators with foreign translators such as Gerard appears to have usually been limited in scope and duration. At any rate, Galib is never named as a collaborator on any other of Gerard's translations; and the assumption that translators usually worked in pairs[15] is an undue extrapolation from the very scanty occurrences. Rather than assume, as is easily done, that all translators worked in collaboration, the truth appears to be that the case was special and remarkable enough to be noted whenever it occurred. At any rate, in the case of Gerard, only Galib is mentioned as having collaborated on the *Almagest*: and the list drawn up by Gerard's associates makes no mention whatsoever of their direct collaboration in any translation.

What can these associates have been doing, if not helping in the translation? Several answers are possible without having to renounce the conviction that Gerard worked alone most of the time on all the translations ascribed to him (except the *Almagest*). The associates may have been engaged in tracing the many original copies of the Arabictexts to be used by Gerard. Ibn 'Abdūn of Seville's early twelfth-century tratise of *ḥisba* (translated by E. Lévi-Provençal)[16] relates that a Muslim supervisor of the market in Andalusia was asked to forbid "the selling of Arabic books of science to the Christians" because the Christian translators allegedly attributed these works "to their bishops." This prohibition may not have been strictly enforced in Toleo; but surely, given the enormous number and scope of scientific works translated by Gerard, it is easy to imagine the tremendous task of assembling these works and their relevant sources. Gerard may have assigned this task to some of his associates; others may have been employed as editors, "proofreaders," or mere scribes, as Thaddeus of Hungary, mentioned above in relation to the *Almagest,* may geve been.

Characteristics and Method of Gerard's Translations. Very few definive characteristics have been isolated, despite the laudable attempts of a few scholars.[17] The difficulty lies in determining the proper method to be used in the search for identifying characteristics of style. We propose here a new method based on the close examination of one set of translations in Gerard's list and of some others that may be appended, despite their absence from the list. A provisional compilation of such new versions would include, without being exhaustive, the following translations (the number in square brackets is that on Wüstenfeld's list):

1 [1]. Aristotle, *Posterior Analytics* (James of Venice; "Io[annes]")

2 [4]. Euclid, *Elements* (Adelard of Bath; Hermann of Carinthia[?])

3 [5]. Theodosius of Bithynia, *Spherica* (Plato of Tivoli [?]; Robert of Chester[?])

4 [6]. *Archimedes*, *De mensura circuli* (Plato of Tivoli)

5 [13]. Al-KhwārizmAbī, *Algebra* (Robert of Chester)

6 [29]. Thābit ibn Qurra, *De motu accesionis*(John of Seville)

7 [21]. Al-Farghānī, *Liber continens capitula XXX* (John of Seville)

8 [33]. Pseudo-Aristotle, *Liber de causis* (Gundissalinus[?])

9 [34]. Aristotle, *Physics*(anonymous)

10 [42]. Al-Fārābī *De scientiis* (Gundissalinus) To these may be added some new versions not included in the list compiled by the *socii:*

11. Al-KhwārizmAbū, *Arithmetic* (John of Seville; Adelard of Bath [?])

12. Qustā ibn Lūqā,*De differentia spiritus et animae* (John of Serville)[18]

13. Al-Zarqälī *Canones* (Robert of Chester)

14. Alcabitius (al-Qabīsī) [?] (John of Serville)

15. Abū Ma'shar, *Liber maioris introductorii* (John of Seville)

The above list includes revisions of translations by earlier scholars and by others contemporary with Gerard in northern Spain. The unpublished The manuscript tradition of Abū Ma'shar's still unpublished *Greater Introduction* reveals a revision—sometimes extensive, occasionally sporadic or nearly absent—that exhibits identifying characteristics observable in some of Gerard's other reworkings. On the other hand, Daniel of Morley provides testimony that Gerard delivered public lectures in Toledo on this very text. It had been translated in 1133 by John of Seville, whose approach to translation Gerard adopted.

A close examination of three of these reworkings through comparison with the Arabic original and with the earlier Latin translation sheds light on Gerard's strategy. He appears to have weighed the earlier Latin translation against the Arabic, retaining what seemed to him passable and simultaneously reducing the lexical usage to a standard one, substituting *generatio* for *effectus* or *constitutio* (Arabic *kawn*)and *corruptio*for*destructio* (Arabic *fasād*). Moreover, he restored all passages and constructions omitted in the earlier translation, often altering its vocabulary to make it better suited to Latin scientific usage. In this process of trial and practice, Gerard showed an increasing preference for the manner of John of Seville, from whom Gerard adopted many characteristic expressions. For example, in al-Farghānī's work, Gerard restored the chapter on comparative eras omitted by John, who had already treated this subject in another work. But in al-Fārābī's *De scientiis* already translated by Gundissalinus, noting Gundissalinus' ruthless editing, Gerard completely restored the original and transformed Gundissalinus' Latin vocabulary. The form of Gerard's translations thus resembles that of John of Seville: closeness to the Arabic original, preservation as far as possible of the construction of the Arabic sentences, and scrupulous rendering of nearly every word contained in the Arabic. Undoubtedly, much of Gerard's knowledge of Arabic was acquired through working with the older translations, which directed him ultimately to the adoption of the word-for-word method of John of Seville.

Gerard's Translations and Works . Although the list drawn up by Gerard's *socii* has often been proved absolutely reliable with respect to the items it contains, it cannot be considered exhaustive. Modern scholarship concurs in this view, and a strong need has been felt to add to, rather than subtract from, the list.

Although Sarton's list in his *Introduction to the History of Science* (II, 339-344) may serve some purpose for its bibliographical information, it has the great inconvenience of rearranging the order of subject matter as well as the numbering from the *socii* list given by Wiistenfeld, which it seems preferable to perserve for clarity and historical accuracy.[19] Sarton's aim appears to have been to separate "classical" (Greek) authors and works in science and philosophy from Arabic commentaries on Greek and Arab authors in the same fields. The distinction is of questionable scholarly value, since the Arab authors depended heavily upon their Greek models, adding much commentary of their own. Moreover, Sarton thus provided an unwarranted basis for the mistaken historical notion (too easily adopted by users of the list, if not by Sarton himself) that the twelfth-century translations helped Western scholars to recover Greek science in its original form.

The interplay between Greek science and Arab scholarship is an important histórical factor and should not be underemphasized. Gerard's transmission of this heritage to the West had an exclusivley Arab garb[20] that directly reflected scholarship in the Arab world at the time of the Latins' contact. Furthermore. Gerard's influence perpetuated this interplay throughout most of the Middle Ages. Even the Greek interests revived by William of Moerbeke's translations in the late thirteenth century remained minor in comparison with the weight still carried by the Arab tradition (except in Moerbeke's translations of Aristotle, which were extensively used in the fourteenth century): the best proof is the influence on optics and on geometry exerted by Gerard's translations of Ibn al-Haytham (Alhazen) and of Euclid. Latin science and philosophy of the twelfth-fourteenth centuries was totally dependent on the Arabic tradition. This is in sharp contrast with the situation of

scholarship in the Renaissance, which revived the original Greek texts. This crucial distinction should be borne in mind, for Sarton's rearrangement of the *socii* list mistakenly transfers to the twelfth century the humanists' fixation on Greek authors.

The *socii* list has been published and commented upon several times during the last century[21] and has recently become available in an English translation by Michael McVaugh with additional useful bibliographical annotations. We shall list here Gerard's works, both translations and original treatises, according to the order and categories of the *socii* list. Only such bibliographical information and criticism as can be added from recent scholarship are presented. For the Arabic background to the originals translated by Gerard, ample references are given to the recent works of two Oreintalists: Fuat Sezgin, *Geschichte des arabichen Schrifttums*, and Manfred Ullmann, *Die Medizin im Islam* (1970) and *Die Natur- und Geheimwissenschaften im Islam* (1972).

Gerard's Translation . The first number is that of Wüstenfeld; the number from Sarton's list follows in square brackets.

A. Works on logic (3 works).

1[I]. Aristotle, *Analitica posteriora*. There is a second, revised edition (1968) by L. Minio-Paluel-lo and B. Dod in which Minio-Paluello shows that the original Arabic text used by Gerard was not the translation of Matta ibn Yūnus, but another, anonymous one. See also *Aristoteles latinus (AL)*, I,48,no. 13.

2[2]. Themistius, *Commentarius super Posteriores analiticos*. See *AL*, I, 99, no. 97, and "Specimina," pp. 206-207. Edited by J. Reginald O'Donnell, in *Mediaeval Studies*, **20** (1958), 239-315.

3[3]. Al-Fārābī, *De syllogismo*. Incipit *TK* 925: "Nostra in hoc [libro] intentio est famosas scientias…." (*TK* is L. Thorndike and P. Kibre, *A Catalogue of Incipits of Mediaeval Scientific Writings in Latin,* 2nd ed. [Cambridge, Mass., 1963].) Probably this was some from of *Prior Analytics,* commentary, according to Wūstenfeld, p. 59. It should be compared with al-Fārābī, *Short Commentary on Aristotle's Prior Analytics*, translated from the original Arabic with introduction and notes by Nicholas Rescher (Pittsburgh, 1963).

B. Works on geometry, mathematics, optics, weights, dynamics (17 works).

4[24]. *XV Books of Euclid (Elements)*, M. Clagett, "The Medieval Translations From the Arabic of the *Elements* of Euclid," in *Isis*, **44** (1953), 16-42; and *Archimedes in the Middle Ages*, I (Madison, Wis., 1964), p. 228, note, and index; A. A. Bjornbo, "Gerhard von Cremonas Übersetzung von Alkhwarizmis Algebra und von Euklids Elementen"; F. Sezgin, *Geschichte des arabischen Schrifttums*(GAS). V (Hajjaf's translation), 89-90, no. 4, 100-101, 103, 116, 117; H. L. L. Busard, "Über einige Euklid-Skolien …," in *Centaurus,* 18 (1974), 97-128. [Text as yet unpublished, but worked upon by Busard and J. Murdoch.] Books I and V have been edited in the dissertations of Sister Mary St. Martín Van Ryzin. O.S.F. ("The Arabic-Latin Traditions of Euclid's *Elements* in the Twelfth Centur" University of Wisconsin, I960. 321-399); and Thomas J. Cunningham ("Book V of Euclid"*Elements* in the Arabic-Latin Traditions,"rabic-Latin Traditions,'University of Wisconsin, 1972, 337-398), respectively.

5 [29]. Theodosius, *Spherica*. GAS, V, p. 155, 272; F. Carmody, *The Astronomical Works of Thabit ibn Qurra,* 2nd ed. (Berkeley, 1960), p. 22 (hereafter *fhabit* [I960]). Incipit TK 1523: "Sphera est figura corporea una quidem superficie.…" Also *ibid.:* "Sphera est figura solida una tantum superficie.…" Differences in wording do not necessarily imply a different version but, rather, probably scribal or reader's variants. F. Carmody, *Arabic Astronomical and Astrological Works in Latin Translation* (Berkeley. 1956), 22 (hereafter *AAAL*), ascribes the first incipit to Plato of Tivoli and the second to Gerard.

6[26]. Archimedes, *De mensura circuit*. M. Cla-gett, "Archimedes in the Middle Ages; the *De mensura circuli* in *Osiris*,**10** (1952), 587-618; and *Archimedes,* I,esp. 30-58; GAS, V, 130-131, 289." [Clagett, 30, n. 3, erroneously gives no. 7 to this item in the list.]

7[37]. Ahmad ibn Yūsuf, *De arcubus simillbus*. F. Carmody, *AAAL*, no. 20, 2; and *Thabit* (1960), 231; *GAS*, V, 160; 288-290, 402. Edited by M. Curtze, in *Mitteilungen des CopernicusVereins für Wissenschaft and Kunst zu Thorn*,**6** (1887). 48-50; and more recently by H. L. L. Busard and P. S. van Koningsveld, in "Der *Liber de arcubus similibus* des Ahmed ibn Jusuf" in *Annals of Science*,**30** (1973), 381-406. Wiisten-feld places Ahmad's death in 1002 (Busard [*loc. cit.,* p. 383] says 912), yet he was writing in 920 and probably died in 942.

8 [32]. Menelaus, *Sphaerica*. Carmody, *AAAL*, 22; and *Thabit* (I960), 221, spec. 15: GAS, V, 162, no. 3. Incipit TK 397: "Declarare volo quali-ter faciam supra punctum datum.…" Francesco Maurolico's Latin text (Messina, 1558; Rome, 1587, with Clavius' *Astrolabium*) seems to contain another Latin version. At any rate, neither for this text, nor for Theodosius' *De habitutionibus* (no. 26, below), which he also published with his own scholia, did Maurolico indicate the source of his Latin text.

9 [40]. Thābit ibn Qurra, *De figura alehata*. Carmody, *AAAL*, 121-122; and *Thabit* (1960), 159- 164, three versions; the first one (*versio* F)—"Quod de figura nominata sectore…" (p. 159) corresponds closely to TK 1252. Also see GAS, V, 268.

10 [34]. Banū Mūsā, *Geometria*. Carmody, *AAAL*, 48-49; and *Thabit* (1960), 22; GAS, V. 246 ff. Also see M. Curtze, "Liber trium fratrum de geometria," in *Nova acta Academiae Caesarae Leopoldino Carolinae germanicae naturae curio-sorum,***49** (1885); and Ciagett, Archimedes, I, 223-367.

11 [38]. Ahmad ibn Yūsuf, *De proportione et proportionalitate*. Carmody, *AAAL*, 130- 131; GAS. V, 289. Recent edition by D. Schrader (Ph.D. diss., University of Wisconsin, 1961).

12 [44]. *Liber iudei super X^m Euclidis*. GAS, V, 175, 287, 389. G. Junge, "Das Fragment der lateinishen Übersetzung des Pappus-Kommentars zum 10. Buche Euklids," in *Quellen und Studien zur Geschichte der Mathematik, Astronomic und Physik,* Abt. B, 3 (1934), 1 - 17, is a partial Latin version from Paris, MS BN lat. 7377A, which Junge thinks may be the translation by Gerard of Cremona.

13 [35]. Al-Khwārizmī, *De iebra et almucahala* (Algebra). G. Libri's edition (*Histoire des sciences mathémaliques en Italic,* I[Paris, 1838], 253-297), is of a different text than the one published by B. Boncompagni in *Atti dell'Accademia ponrificia del Nuovi Lincei,***4** (1851), 412-435. See A. A. Björnbo, "Gerhard von Cremonas Übersetzung von Alkwarizmis Algebra und von Euklids Elementen," in *Bibliotheca mathematica,* 3rd ser., **6** (1905), 239-248; L. Karpinski, *Robert of Chester's Latin Translation of the Algebra of alKhowarizmi* (Ann Arbor, 1915). repr. as pt. I of Karpinski and J. G. Winter, *Contributions to the History of Science* (Ann Arbor. 1930); *GAS*, V. 239-240; Carmody. *AAAL*, 47 -48.

14 [47]. *Liber de practica geometrie*. M. Mc-Vaugh suggests that this is identical with al-Kara-ji's *De mensuratione terrarum*. without specifying fürther (see no. [82]). The identification remains obscure and problematic; three works briefly described in *GAS*, V, 387-391, could qualify as the Arabic original: Abū 'Uthmān Sa'īd (387), Ab-bacus (388), and al-Karajī (389-391). We have been unable to identify the incipit of Gerard's version included in the *socii* list.

15 [39]. Al–Nayrīzī, *Super Euclidem*. *GAS*, V, 283-284; Carmody, *Thabit* (1960), 22. Edited by M. Curtze in *Euclidis opera omnia*. *Supplementum* (Leipzig, 1899).

16 [25]. Euclid. Data. *GAS*, V, 116; Carmody. *Thabit* (1960). 22. See Shunturo Ito. "The Medieval Latin Translation of the Data of Euclid" (Ph.D. dissertation. University of Wisconsin, 1963), 19-20.

17 [53]. Tideus (Diodes), *De speculo*. Carmody. *AAAL*. 79: and *Thabit* (1960). 233 (spec); *GAS*, V. 117. The original list has "Tideus. De speculis comburentibus," which represents a compression of two distinct works translated by Gerard: *Tideus de speculis,* edited in A. A. Björnbo—S. Vogl. "Alkindi, Tideus und Pseudo—Euklid"; and Ibn al—Haytham's *De speculis comburentibus,* edited by J. L. Heiberg and E. Wiedemann as "Ibn al—Haitams Schrift liber parabolische Hohlspiegel," in *Bibliotheca mathematica,* 3rd ser., **10** (1909- 1910), 201-237.

18 [54). Al—Kindī, *De aspectibus* (optics). See Bjornbo and Vogl. "Alkindi, Tideus und Pseudo—Euklid": Carmody, *AAAL,* 79: and *Thabit* (1960), 231 (spec.): *GAS*, V, 117.

19 [not in Sarton]. *Liber divisionum*. Is this a work by Al—Baghdādī (Ibn Tahir)? See R. C. Archibald, *Euclid's Book on Divisions of Figures* (Cambridge, 1915): and *GAS*, V (1974). 387-388, 394-395.

20 [55]. Thabit ibn Qurra, *Liber Qarastonis*. Edited by M. Ciagett and E. A. Moody, in *The 'Medieval Science of Weights* (Madison, Wis.,1952; repr. 1960). Previous information on this work by Thābit must now be checked against K. Jaouiche, "Le livre du Qarastun de Thabit ibn Qurra," in *Archive for History of Exact Sciences*.**13** , no. 4 (Nov. 1974), 325-347. Jaouiche's dissertation (Paris, 1972) on Thabit's *Qarastun* appears to be of importance (it includes one Arabic text of the *Qarastun).*

C. Works on astrology (astronomy) (12 works).

21 [36]. Al-Farghānī (Alfraganus). John of Seville's translation (edited by F. Carmody [Berkeley, 1943]) was entitled *Liber Alfragani in quibus—dam collectis scientie astrorum et radicum motttum planeturum et est 30 differentiarum*. Gerard's version (edited by R. Campani [Florence,1910]) was entitled *Liber de aggregationibus scientiae stellarum et de principiis coelestium motuum quern Ametus composuit filius Ameti quidictus est Alfraganus 30 continens capitula*. The differences of vocabulary introduced by Gerard in his new versions appear strikingly in the titles. On al—Farghānī's work, see *GAS*, V, 259-260.

22 [33]. Ptolemy, *Almagest*. See P. Kunitzsch, *Der Almagest: Die Syntaxis mathematica des Claudius Ptolemäus in arahischlateinischen Überlieferung* (Wiesbaden, 1974).

23 [31]. Geminus of Rhodes [?], *Liber introduc—torius Ptolemei ad artem spericam*. The original text cannot have been written by Geminus, as M. McVaugh makes clear; however. K. Manitius *(Deutsche Literaturzeitung* [1899], col. 578) reminds his readers of the close parallels between this Latin version and Geminus' work, which he edited; see *GAS*, V, 157-158 (Agāniyus). It also could be by Pappus of Alexandria (see *GAS*, V, 175, no. 2). The relation of Gerard's translation to the *Introduction è l'Almageste* by Eutocius presented by J. Mogenet (Brussels, 1956), who knew of a thirteenth-century(?) Latin translation (Mogenet, p. 38), is not yet clear. At any rate, Gerard's original must have been an Arabic text.

On the other hand, a Leningrad (Acad. Cod. AB-111; present shelf mark F.N.8) manuscript in its earlier (twelfth-century) portion contains, among works of Gerard of Cremona, an anonymous treatise beginning "Dividitur orbis signorum in 12" (fol. 25r) and containing the explicit (fol. 35va) "incipit stella superbus oriri et ac-cidit cum ea aqua. (R) Explicit quod abreviatum est de libro introductorii Ptholomei ad librum suum nominatum Almagesti." The incipit is strikingly similar to a work frequently ascribed to Ptolemy in medieval Latin manuscripts and beginning "Signorum alia sunt masculina" easily confused with a work by Zahel (Sahl ibn Bishr) with a nearly identical incipit—and content, for that matter—translated by John of Seville. Paris BN codex lat. 16208 contains three different works with nearly the same incipit as above; one is ascribed to Zahel, another to Ptolemy, and the third has been tentatively assigned to Raymond of Marseilles (Mile. M. T. d'Alverny, private communication). Perhaps item 23 in the socii list of Gerard's translations indicates this work; but we have our doubts.

24 [46]. Jābir ibn Allāh, (Geber) *De astronomia libri IX* (Nuremberg, 1534). Carmody, *AAAL* no. 35, 1 (p. 163); *GAS*, V, 53: R. P. Lorch. "Jābir ibn Aflah and His Influence in the West" (Ph.D. dissertation. University of Manchester. 1970).

25 [80], Māshā'allāh (Messahalla), *De elementis et orbibus celestibus*. Incipit TK 722: "Incipiam et dicam quod orbis est prescritus spericus…" This corresponds to the incipit assigned by Alber—tus Magnus in his *Speculum astronomiae* to a work by Messahalla, *De scientia mot us orbis*, which Albert describes as a "lateetcompendiosius" treatment of the sphere according to the *Almagest*. In *Le système du monde* (**II** , 204-206) **P. Duhem** gives a summary analysis of this astronomical work by Māshā'allāh in Gerard of Cremona's translation. Sarton, I, 531, calls it the most popular work by Māshā'allāh in the Middle Ages, an evaluation that does not correspond to the vestiges of the manuscript tradition. There are literally hundreds of surviving manuscripts of the astrological works of Masha'allah translated by John of Seville (see L. Thorndike, "The Latin Translations of Astrological Works by Messahalla," in *Osiris*,**12** [1956], 49-72), but only a few manuscripts of the *De elementis et orbibus* (see Carmody,*AAAL* 32-33). Of Māshā'allāh's astrological works translated by John of Seville, only his *Epistola de rebus eclipsium* has a slight astronomical background; this work, however, is in twelve chapters with the incipit "Quia Dominus altissimus fecit terram ad similitudinem spere . . ." (TK 1217), and thus would seem to correspond to article 2 in Ibn al-Nadlm's list in the *Fihrist:* "The Great Book of the 21 [12?] on Conjunctions, Religions and Sects." M. Ullmann, *Die Natur und Geheimwis-senschaften im Islam* 304, "supplies information on the works of Māshā'allāh that is based on the research of" L. Thorndike, E. S. Kennedy and D. Pingree. In fact. Thorndike's studies on Māshā'allāh's Latin manuscripts show the great complexity of identification by titles and manuscript ascriptions.

The translation of Māshā'allāh's work by Gerard of Cremona is entitled *De elementis et orbibus cell's tibus* in the *socii* list and was so printed by Joachim Heller (Nuremberg, 1549): *De elemcniis et orbibus celestibus liber antiquus ac eruditus Messuhalae laudatissimi inter arabes astrologi;* this edition is not to be confused with the 1549 edition published at Nuremberg of other works of Masha'allah translated by John of Seville under the title of *Messahallae libri tres*. Gerard's translation had already been published by J. Stabius in 1504, also at Nuremberg, under the title *De scientia motus orbis*. This was the title under which it was known to Albertus Magnus, who describes it in his *Speculum astronomiae* (on the *Speculum*, see the forthcoming edition by Paola Zambelli): "deeodem material in the *Almagest* agitur satis late et compendiosius in libro Messahalach" *De scientia motus orbis* qui sic incipit: "Incipiam et dicam quod orbis…" — the incipit in our present work translated by Gerard of Cremona. The Arabic original seems to be the one listed as no. 8 in the *Fihrist* (see H. Suter, "Die Astronomen und Mathematiker," 5): "The book known as the 27" — it contains twenty-seven chapters. Ullmann gives no hint of the existence of this book by Māshā'allāh either in Arabic or in Latin translation.

26 [30]. Theodosius, *De locis habitationibus*. Incipit TK 660 (and 684): "Illis ["In illis" 684] quorum habitations loca sunt sub polo.…" This wording makes it slightly different from the text used by Maurolico, who added his own scholia and some ancient ones (Messina, 1558; Rome, 1587). The 1587 version is entitled *Autolyci De sphaera quae movetur* (see no. 30). Maurolico's text begins (prop, la): "Qui sub polo boreali habitant, iis quidem mundi hemisphaerium alterum idem semper conspicuum est.…" See Carmody, *Thabit* (1960), 219, spec. 7; *GAS*, V, 155-156.

27 [28]. Esculeus [Hypsicles], *De ascensionibus signorum*. Incipit TK 1449: "Si fuerint quotlibet quantitates quarum numeratio.…" Carmody, *Thabit* (1960), 22, and spec. p. 201; *GAS*, V, 143-145. See V. de Falco and M. Krause, eds. and trans., "Hypsikles, Die Anfangszeiten der Gestirne," *Abhandlungen der Akademie der Wissenschaften zu Göttingen*, 3rd ser., no. 62 (1966), with intro. by O. Neugebauer, which contains a Latin version by Gerard incomplete in the footnote section; reviewed by P. Kunitzsch in *Zeitschrift der Deutschen morgenländische Gesellschaft* (ZDMG), **118** (1968), 180-181.

28 [41]. Thābit ibn Qurra. *De exposilione nominum Almagesti*. Edited by F. Carmody in *Thābit* (1960), 131-139.

29 [42]. Thābit ibn Qurra, *De motu accessionis et recessionis* (also known as *De motu octave spere)*. Probably also translated by John of Seville; see J. Millás Vallicrosa, "Una obra desconocida," in *Osiris*, **1** (1936), 456-458; and "El liber de motu octave spere de Tabit ibn Qurra," in *al-Andalus*,**10** (1945), 89- 108. Edited by F. Carmody in *Thābit* (1960), 102-113. See also Otto Neugebauer, "Thābit ben Qurra… 'On the Motion of the Eighth Sphere," in *Proceedings of the American Philosophical Society*,**106** (1962), 290-299. The incipit of this work of Thābit translated by Gerard is *TK* 661: "Imaginabor speram…" and is the same as in Carmody's edition. *TK* gives two other incipits for the same work: *TK* 106, "Annus itaque Solaris vere loquendo," and TK 1703, "Vis motus et maxime corporum celestium…." the latter identified by *TK* as words of the prologue to a commentary on Thābit's work. The information given by Albertus Magnus in his *Speculum astronomiae* on the relation between the astronomical works of Thābit, al-Zarqālī, al-Battānī, Jābir ibn Aflah, John of Seville, al-Bitrūjī, and Ptolemy's *Almagest* (and Hipparchus' precession) ought to bear on the solution of that question. We must, however, reserve for a separate

work on the authenticity of the *Theorica planetarum* ascribed to Gerard of Cremona the consideration and interpretation of this evidence.

30 [23]. Autolycus, *De sphaera mota*. Incipit TK 1151: "Punctum equali motu dicitur moveri..." The text published at Rome in 1587, *Autolyci De sphaera quae movetur liber,* together with *Theodosii Tripolitae De habitationihus liber* (bound with Christoph. Clavius, *Astrolabium* |Rome, 1593], in Columbia University Library copy) and given as from "losepho. Avria. Neapolitano Interprete" has a different incipit: "Hypotheses." 1. Aequabiliter puncta ferri dicuntur.…"It probably is not the translation by Gerard, although the" "interpreter" claims not to have translated it from the Arabic or Greek but to have extracted it from the Vatican Library. This printed text of the *De sphaera quae movetur* includes the scholia by Maurolico as does Theodosius' *De locishabitationihus* (see no. 26).

31 [50]. *Tabulae Jahen cum regulis suis*. See H. Hermelink, ". Tabulae Jahen" in *Archive for History of Exact Sciences***2** (1964), 108-112. Hermelink establishes that this is the work entitled *Scriptum antiquum Saraceni cuiusdanu de diver-sarum gentium eris annis ac mensibus, et de reliquis asironomiae principiis,* published by J. Heller (Nuremberg, 1549). The author is Qadi Abū Abdallah ibn Mu'adh al-Jāihanī of Jaén (989- 10791]), the second of the two Abū 'Abdallāhs suggested by Sarton. A. I. Sabra "The Authorship of the *Liber de crepusculis,* an Eleventh-Century Work on Atmospheric Refraction,"in *Isis*,**58** [1967], 77-85) had already suggested this Qadi as author of the Jahen Tables as well as the author of no. 32 (below).

32 [56]. Abū'Abdallāh, Muhammad ibn Mu'adh *De crepusculis,* sometimes entitled *De ascension-ibus nuhium*. No longer to be ascribed to Ibn al-Haytham, as was demonstrated by Sabra in *Isis:* see *GAS*, V. 49, 364. Edited by Petri Nonii (Pedro Nunez) Salaciensis as *De crepusculis liber*. *Item Alhacen Arabis vetustissimi de causis erepus -culorum liber unus a Gerardo Cremonense jam olim laitnilale dona (us; nunc vero omnium primum in lucem editus* (Lisbon, 1541). Also published by F. Risner in *Opticae thesaurus Alhazeni* under Alhazen's name (Basel, 1572), 283-288. The 1541 edition includes an appendix by Gerard of Cremona in which he states that he has "omitted the terminal words of the Arabic original by which the author praises God in the manner of the Saracens" as being needless (see Wiistenfeld, p. 66). The incipit of the *De crepusculis* is *TK* 1021, "Ostendam quid sit crepusculum" and *TK* 1022, "Ostendere autem volo in hoc tractatu quid sit crepusculum."

D. Works on philosophy (11 works).

33 [9]. Pseudo-Aristotle, *De expositione bonitalis pure (Liter de causis)*. *AL,* I, 94, no. IV; and spec. 196. See Bernard Carra de Vaux, "El liber de Causis' primis et secundis el de fluxu qui consequitur eas'" in *al-Andalus***9** (1944), 419-440; M. Alonso Alonso, "El liber de Causis," *ibid*., 43-69, and 10 (1945), 345-382. Incipit *TK* 996: "Omnis causa primaria [primitiva] plus est influens.…"

34 [5]. Aristotle, *De naturali auditu (Physica)*. See *AL,* I, 51, no. XV; and spec, 125-126 (this translation had little success, according to *AL*).

35 [4]. Aristotle, *Liber caeli et mundi*. See *AL*, I, 53, no. 18, and spec., 128- 129 (the only popular translation of this text in the early thirteenth century, according to *AL*). See the study of its lexical particularities by I. Opelt, "Zur Übersetzungs-technik des Gerhard von Cremona," in (*Glotta*.**38** (1959), 135-170.

36 [10]. Pseudo-Aristotle, *De causis proprieta-tum eiementorum*. See *AL,* I, 91 (not to be confused with *Liber de causis,* no. 33 above).

37 [6]. Aristotle, *De generations et corrupttone*. Sybil D. Wingate, *The Medieval Latin Versions of the Aristotelian Scientific Corpus*… (London, 1931), 45-46; AL, 1, 55, no. 21, and spec, 132-133 (little success in the Middle Ages, according to *AL*).

38 [7]. Aristotle, *Meteorologies* books I-III. See Wingate, *Medieval Latin Versions,* 45-46; AL. I, 56, no. 23, and spec., 133; also II, 788; A. Pelzer, "Une source inconnue de Roger Bacon" (1919), reprinted and enlarged in a posthumous edition by A. Pattin and Emile van de Vyver, *Études d'histoire littéraire sur la scolasticpie médievale,* Philosophes Médiévaux, no. 8 (Louvain-Paris,1964), 241-271.

39 [11 - 14]. Alexander of Aphrodisias, *De tempore, De sensu*, and De augmento. to which Wiistenfeid adds *De intellectu*. Wlistenfeld states that Paris, MS BN lat. 6443 contains *De augmento, De tempore, and De intellects* as items 19, 20, and 25 in the codex. The same portion of the manuscript, however, contains a *De intellectu* at fol. 195r (no. 21), immediately after the *De augmento* (no. 19) and the *De tempore* (no. 20); this *Deintellectu* is ascribed there to al-Kindī, while no. 18 of the codex (fol. 193r) is a *De imitate* ascribed to Alexander in the title (and in Sarton's list. no. 15) but to al-Kindā in the colophon, thus showing the complexity of identifying Gerard's translations through manuscript ascriptions. Similarly, a *De tempore* ascribed to al-Fārābī and said to be translated by Gerard in a London BM codex (Royal 12.C.XV, fol. 149) has been shown by A. Birkenmajer to be not by al-Fārābī but by Alexander of Aphrodisias.

On al-Kindīs *De intellectu*, see J. Jolivet, *L'intellect seion* Kindi (Leiden, 1971). *TK* lists three different incipits of a *De intellectu* or its equivalent ascribed to al-Kindī. *TK* 755 (and 756); "Intellexi [756. "Intelligo vel intellexi"] quod queris [scilicet] scribi tibi sermonem brevem" is identified as belonging to al-Kindī's *De intellectu*, but in a translation by John of Seville. *TK* 755-"Intellexi quod quesivisti de scribendo sermonem in ratione abbreviatum…" — is ascribed to al-Kindī with

the title *Verbum de intentione antiquorum in ratione*: and Gerard is credited as translator. It was published in *Beiträge zur Geschichte der Philosophie des Mittelahers (Beiträge)*. **2** , no, 5 (1897), 1-10. TK 1390 is "Scias quod videmus apud Aristotelem est tribus modis…," identified as a *De intellectu* and ascribed to Alexander (Alkindi) *[sic]*. The incipit of Alexander's *De sensu* is *TK* 1069; "Postquam consumavit Aristoteles in libro suo…" it was published by Gabriel Théry in *Alexandre d'Aphrodise* (Kain [Belgium], 1926). 81-91 (see McVaugh). The incipit of Alexanders *De augmento* is *TK* 136: "Aristoteles dicit in libro de generations et corruptione quod.…" Published by Théry, 99-100.

40 [19]. Al-Fārābī, *Commentary on the Physics of Aristotle*. The translation, long thought lost, was recovered by Alexander Birkenmajer, Aus der Geisteswelt des Mittelalters. Studien und Texte Martín Grabmann zur Vollendung des 60. *Lebens-jahres… gewidmet* (Munster, 1935), text on 472-475.

41 [16]. Al-Kindī, *De quinque essentüs*. Edited by Albino Nagy, in *Beiträge*, **2** , no. 5 (1897), 28-40. The subject matter is nearly identical (the five essences are cause, matter, form, time, and space, paraphrased from Aristotle's Metaphysics) with Hermann of Carinthia's *De essentüs*, completed in 1143 and dedicated to Robert of Chester; publication of the latter was announced by Hermann directly to his "beloved" master, Thierry of Chartres. C. H. Haskins thought that the two works were totally different, failing to see that Hermann was merely trying to "Christianize" the Arab Peripateticist's new metaphysics of Neoplatonic bent.

The term *essentiae* had been thrown about among Latin scholars by Hermann, who sought to render the Arabic *wujūd* ("existent ones") as "the primary causes of all beings." This term, frequently used also by al-Fārābī in his *De scientiis* (translated by Gundissalinus and again by Gerard [see no. 42 below]), was treated quite differently in Latin by Gundissalinus and by Gerard. In chapter IV of the *De scientüs* (A. González Palencia, ed., *Al-Fārābī Catálogo de las ciencias . .* ", 2nd ed. [Madrid, 1953], 106 ff.), for instance, we find two expressions in the Arabic rendered diversely by *esse* or *essential* in the two translations; they are *qiwām* or *wujūd* (or *mawjūd mawjūdāt)*. *Qiwām*, meaning prop, support, basis, or sustenance, is employed six times in the chapter, always with reference to the mode of existence of an accident inherent in a subject. Although Gundissalinus always rendered it by *esse*,[22] Gerard always translated it as *essential*. The root *wjd* occurs twenty-six times in al-Fārābī's *De scientüs*. In the twelve instances of the form *wujūd*, it is rendered as *esse* by both Gundissalinus and Gerard, except for one case when Gerard slips into *essential*: Gerard's identification with Gundissalinus here is a good instance of what is involved in the "reworkings": the basic canvas of the older translation is altered only in specific circumstances of disagreement. Three times the root appears in the form *mawjūd*, also rendered as *esse* by both Gundissalinus and Gerard. When the root appears in the form *manjūda* (four instances), to designate existent beings, it is rendered twice by *sint* in Gundissalinus (idiomatically closer to correct Latin usage), while Gerard uses *inventa* ("are found."—that is. "found to exist"), precisely the term that was preferred by John of Seville in identical context. The two other instances of*manjūda* are rendered by *essential* and by *essentialis* in Gundissalinus. and each time as *existentia* by Gerard. In the final section of the chapter dealing with the subject matter of Aristotle's *Metaphysics*, for the first causes or principles of real being (the celestial bodies), the Arabic term most frequently used by al-Fārābī is *mawjūdāt* the "existent" ones. The term occurs seven times in that section, always with the same connotation. Here, Gundissalinus uses *essential* six times and Gerard has existentia; the seventh occurrence is rendered by *esse* in both Gundissalinus and Gerard.

These simple statistics tend to indicate that in the early phase of translations of philosophical or astrological works (John of Seville is also heavily involved in the vagaries of this terminology) from the Arabic, the term*;essential* inherited from Boe thins to designate the "essence" of a thing was imperceptibly transferred (by Gundissalinus and partly by Gerard) to designate "existent" beings, or the highest causes or principles of being in Peripatetic metaphysics. The direct role of the *Arabic falsafa*is understandable in al-Kind's *De quinqtic essentüs as well as* in Hermann of Carinthias*De essentüs* (published very inadequately by M A. Alonso (Santander, I946J). in*De quntique essentüs* al-Kindī reckoned the following five *essentie* to explain the entire chain of beings and causality therein: cause, matter, form, time, and space. The number of essentie corresponds to al-Fārābī's own number in chapter IV of his *De seientüs* where he hesitates, however, between three and five, depending on the approach).

Incidentally, the idea of selecting a fixed number of essentie to explain the world of being seems to have originated with the Haranians or Sabaeans, whose philosophical elucubrations on that theme the*Fihrist reports casually*. Their approach is quite different from that of Aristotle in the *Metaphysics,* where the "unmoved movers," discovered through the astronomy of Eudoxus, may amount to anywhere between forty and fifty. Before the advent of the works of Aristotle in Arabic translations, the prism of Haranian and Hermetic speculation diffracted the problem-setting process among Arab philosophers.*As the failasūf al-arāb al- Kindādem*-Demonstrated in his *De quinque essenilis*how he reduced philosophical speculation to a strict Aristotelian frameswork, although the cast of a *De essentüs* left its mark on the format of Arabic philosophical speculation. So also did the cast work on Latin philosophical speculation in the twelfth century under the impact of the Arabs. Hermann of Carin-thia counted six rather than five *essentie* by Christianizing the first one,*causa,* which he divided into two *essentie:*on the one hand, God as creator and First Cause, and, on the other hand, the celestial bodies as created but first active causes in the physical universe.

The most notable feature of Gerard of Cremona's reworking of Gundissalinus' translation of al-Fārābīs *De scientiis* as explained above, was the distinct effort to depart from the recent practice of translating *mawjūdāt by essentie*and to stress, in the form of his *existentia,* the opposition between essence and existence, thus moving away from the earlier Boethian usage of essentia. It is, however. somewhat puzzling why, in translating al-Kindī's *De quinque essentüs*.Gerard retained the expression in the title. Either he translated this work very early in his career, possibly before his reworking of Gundissalinus' translation of al-Fārābī's *De scientüs*or he may have sought to show the true origin of Hermann's *De essentüs,* a work already known in

Spain and at Chartres at the time it was written (1143). It is not possible to state with any accuracy the fürther impact of Gerard's translation and of Hermann's original *De essentüs* upon the oreintalists of philosophical speculation among the Latins in the twelfth century, and particularly upon the series of treatises written by Latin scholars as *De principüs*or *De sex principüs*[23] The question, however, deserves greater attention in this expanded context.

42 [20]. Al-Fārābī,*De scientüs* ,also translated by Dominicus Gundissalinus [Gundisalvi]. In supplying the bibliographical information concerning the edition of this translations by Gerard in A. González Palencia (Madrid. 1931: 2nd ed., 1953) —see no. 41 —M. McVaugh omitted to state that in addition to the Arabic text and the Latin of Gerard, Palencia's edition also contains the text of Gundissalinus' translation from the edition of Gui-lelmus Camerarius (Paris, 1638) compared with that of L. Baur (Beiträge, 4, nos. 2-3 f 1903]) and a Castilian version by González Palencia. This surprising omission can create problems, since in a note by E. Grant to an extract from Gundissalinus' version that appears later in Grant's Source Book of Medieval Science, there is a reference to a Latin passage in Gerard that is actually to the portion of González Palencia (Madrid. 1931: 2nd ed., 1953) — see no. 41 —M. McVaugh omitted to state that in addition to the Arabic text and the Latin of Gerard, Palencia's edition also contains the text of Gundissalinus translation from the edition of Gui-lelmus Camerarius (Paris, 1638) compared with that of L. Baur (Beitrage,ve.**4** , nos. 2-3 [1903]) and a Castilian version by González Palencia. This surprising omission can create problems, since in a note by E. Grant to an extract from Gundissalinus' version that appears later in Grant's *Source Book of Medieval Science,* there is a reference to a Latin passage in Gerard that is actually to the portion of González Palencia' s edition that contains Gundis-salinus' translations. A later edition of Gundissalinus' *De scientüs*by Alonso[24] shows that this text is a compilation not only from al-Fārābī as a primary source but also from many other Latin sources. Gundissalinus was a recidivist in this kind of compilation that borders on plagiary.[25]

43 [17], Al-Kindī, *De somno et vision*. Carmody. *AAAL* 83; Albino Nagy, ed., *Beitriäge*,**2,** no. 5(1897), 12-27; GAS, III, 376.

E. Works on medicine (physica) (24 works).

44 [60]. Galen, *De elements*. See GAS. III, 87; M. Ullmann, *Die Medizin im Islam*. 38, no. 4. Inci-pit: "Quoniam cum sit element cum minor pars." Richard J. Durling, "Corrigenda and Addenda to Diels" Galenical" 465; and H. Diels, "Die Hand-schriften der antiken Ärzte. Griechische Abt. I. Hippokrates und Galenos/" 64.

45 [58]. Galen, *Expositiones super librum Ypo-cratis de regimine acutarum egritudinum*. GAS, III, 33, 118; Ullmann, 56. no. 61. See Diels, 102-103; Durling, 476. Printed in the Articella (Venice, 1513).

46 [61]. Pseudo-Galen, De secretis. GAS, **III** 126, no. 91; Ullmann.60, no. 103. See wüstenfeld, 69,for manuscripts, incipits, and editions.

47[62]. Galen, De *complexionibus*. Incipit: "Insignes antiqui medicorum et philosophorum." Durling, 472; Diels, 65.

48[63]. Galen, De *malicia complexionis diverse*.**GAS, III,** 109-110; Ullmann, 39, no. 7. Incipit: "Malitia complexionis diverse quandoque." Durling, 466; Diels, 84.

49[64]. Galen, De *simplici medicina*I-V. **GAS, III,** 109-110; Ullmann, 47-no. 49. Incipit: "Nonmihi necesse est hic ostendere." Durling, 471; Diels, 97.

50[65]. Galen, De *creticis diebus*.**GAS, III,** 96, no. 19; Ullmann, 43, no. 30. Incipit: "Ut egritudinum que paulatim non."p; Durling, 465; Diels, 91.

51[66]. Galen, De *crisi*.**GAS, III,** 95, no. 18; Ullmann, 43, no. 29. Incipit: "Ego quidem non intendo." Durling, 464; Diels, 90.

52[59]. Galen, De *expositione libri Ypocratis in pronosticatione*.**GAS, III** 32, no. 3a, and 123, no. 74; Ullmann, 50, no See Diels, 107-108; Durling, 476. Printed in the Articella (Venice, 1513).

53[57]. Pseudo-Hippocrates, *Liber veritatis Ypocratis*. Printed in 25 aphorisms in the ancient Articella. Modern edition by K. Sudhoff (1915). See Ullmann, 33-34.

54[21]. Ishaq al-Isrā ' īlī, De *elementis*. English translation from the Arabic original by A. Altmann and S. M. Stern, *Isaac Israeli, a Neoplatonic Philosopher of the Early Tenth Century* (London, 1958). See Ullmann, 138.

55[22]. Ishaq al-Isrā ' īlī, IlI, *Liber diffinitionum*. Edited by J. T. Muckle, in *Archives d'historie doctrinale et litteraire du moyen age* (AHDLMA), **12-13** (1937-1938), 299-340, translated from the Arabic original in Altmann and Stern. See Ullmann, 138.

56[71]. Al-Razi, *Liber Almansorius,* the shorter of his great medical compilations. It is dedicated in 903 to the ruler of Rayy, Abu Salih Mansur ibn Ishaq ibn Ahmad ibon Asad (see Bayard Dodge, ed. and trans., *The Fihrist of al-Nadim*,**II** [New York, 1970]. 704, n. 169), and not to the Abbasid Caliph al-Mansur (754-775), as stated by M. McVaugh. See GAS, III, 275, 281-

282; Ullmann, *Die Medizin…* 132; and H. Schipperges, *Die Assimilation der arabischen Medizin durch das lateinische Mittelalter* (Wiesbaden, 1964), 92.

57[72]. Al-Rāzī, *Liber divisionum continens***CLIIII** *capitula cum quibusdam confectionibus ejusdem*.From Vatican MS lat. 2392 Boncompagni added *Almansoris before continens,* thus inviting double confusion with the *Liber Almansorius* (no. 56), translated by Gerard, and with the famous *Continens*(al-Hāwī) by al-Rāzī translated in the thirteenth century by Faraj ben Salīm (Moses Farachi or Faragut) and printed many times (GAS, III, 280; Ullmann, 131). The Arabic original of Gerard's*Liber divisionum* seems to be the Kitāb Taqsīm al-Ilal(or al-tasjīr) described in GAS, III, 284, no. 5; and Ullmann, 132. As indicated in the *socii* list,Gerard's translation contained 154 chapters, whereas both the Lyons, 1510, edition and the Basel, 1544, edition of al-Rāzī,s works have a *Liber divisionum* in 159 chapters with the incipit "Ventilata fuit…"

58[73]. Al-Rāzī, *Liber introductorius in medicinam parvus*. This translation, probably of the Kitāb al-mudhal'ila t-tibb, is no. 6 in Sezgin's list (III, 284), and the eighth work entitled *Introductorium medicine* in the Venice, 1500, edition. is entitled (fol. 279v) Liber introductorius parvus in medicinam Rasis, with the incipit "Salvator excelsus et gloriosus…"

The following translations (nos. 58a, 58b, 58c,58d) were shown by L. Thorndike ("Latin Manuscripts of Works by Rasis at the Bibliothéque Nationale. Paris," in *Bulletin of the History of Medicine*,**32** [1958], 54-670 to be regularly present together in a good sampling of manuscript collections of works by al-Rāzī, that were translated by Gerard of Cremona. The ascription to Gerard is not formally stated for each work, but each collection contains some general indication to that effect. The same collection of works likewise was frequently printed together (Milan, 1481; Venice 1497; Venice, 1500; edition. is entitled (fol. 279v) Liber introductorius parvus Lyons, 1510; Basel, 1544) and was ascribed to Gerard of Cremona. There thus exists a strong probability that they were translated as a group by Gerard, as Wustenfeld (pp. 71-72) suggested in 1877, although the *socii* list did not include them by name. By omitting them from his list of them by name. by omitting them from his list of Gerard's translations, Sarton indicates his tacit rejection of Wustenfeld's hypothesis. Thorndike's "Latin Manuscripts… however, seems to us to be nearly decisive in favor of Wüstenfeld's suggestion."

58a [74]. Al-Rāzī, De *iuncturarum egritudinibus*(or doloribus). The incipit Thorndike, "Latin Manuscripts…) is Dixit Rasis. Volo in hoc capitulo dicere medicinas que necessarie sunt doloribus iuncturarum." In several of the Paris manuscripts studied by Thorndike, this translation is grouped with no. 58b under the joint title *Experimenta Rasis*. It is printed with the group in the five early editions listed in no. 58. In Sezgin's list (III, 288) this work is nos. 27 and 28: *Aujā at-maāsil and Aujā al-niqris*. Sezgin (III, 289) expresses doubt about the authenticity of an *Experimenta Rasis (Kitāb al-tajārib; GAS,* no. 34); although he knows Thorndike's "Latin Manuscripts," Sezgin does not bring it to bear on the authenticity of the *Experimenta Rasis*.

58b [not in Sarton]. AI-Rāzī, *De egritudinibus puerorum* (sometimes called *Practica puerorum or de cura [curis] puerorum;* see Paris, BN lat. 6893, fol. 283; lat. 7406, fol. 167; J. de Ketham, *Fasciculus medicine… Tractatus Rasis de egritudinibus puerorum et earum cura qui appellatur practica puerorum* [Venice, 1500]), The incipit begins "Sa-hafati…" The work is often grouped in manuscripts with no. 58a under the title *Experimenta Rasis* and is published with it in the early editions of works by ai-Rāzī (no. 58). Neither Ullmann, nor Sezgin's list compiled from earlier Arabic bibliographical lists of Ibn al-Nadīm. al-Birūnī. and Ibn Abū Usaybi a. contains a title that corresponds to this work translated by Gerard. It may, however, be an extract from a larger work; the matter requires further investigation.

58c [not in Sarton]. AI-Rāzī, *Antidotarium*. The incipit is "Dixi in hoc meo libro medicinas.…" The original Arabic of this translation may be the *Aqrābādīn al-kabīr,* as suggested by Sezgin (III, 283, no. 4) and Ullmann (*Die Medizin…*, 303). We must note, however, that Arabic bibliographi cal lists also mention a *Kitāb al-Qarābādīn as-sagīr* in four chapters by al-Rāzī (GAS. III. 292. I. 28; Ullmann. 103). Ullmann thought that this was the second *Antidotarium* printed in the Basel. 1544, edition (pp. 546-559) and also in the Venice. 1497. edition (pp. 95-98; "Cap. 1. De medici-narum"): while Sezgin observed that there was no manuscript trace of this work in Arabic. Perhaps one should consider the pseudo-Rāzī, *Kitāb Nuzhat al-mulūk* (GAS, III, 291, no. 69; Ullmann. 135 and 332) as another *Antidotarium* by al-Rāzī, for Ullmann describes its contents as dealing with "the removal of all harmful effects of simple and composite poisons and drugs of animal, plant or mineral origin, or of poisoned clothes, drinks or foods, or of things handled by the hand such as snakes, scorpions and various animals." We have not ourselves established the necessary comparison of the two texts to decide the issue.

The Latin *Antidotarium Rasis* is present with nos. 56, 57, 58a, and 58b in seven of the eight Paris manuscripts examined by Thorndike; its incipit— "Dixi in hoc libro meo medicinas quarum necessitas est inseparables.… (R) Verba Abu-becri de redactione librorum suorum (N) lam pri-dem pervenimus ad expositionem relationis egritu-dinum que sunt a summitate capitis usque ad pedes…" — corresponds to the text on p. 452 of the Basel, 1544, edition, *De antidotis*. But in the Leiden, 1510, edition, fol. eclxviii verso, there is mention of an *Antidotarium Rasis* "in quo continentur compositiones plurium medicinarum ad diversas dispositiones… Cap. lum. De aptatione medicinarum ut sine horribilitate possint sumi.…" This last sentence shows that the extract with this incipit found in Paris, BN lat. 6893, by Thorn-dike, who was inclined to treat it as a separate work, probably is part of the short *Antidotarium*.

58d [not in Sarton]. AI-Rāz, *De preservatione ab egritudine lapidis*. The work that in Paris. BN lat. 6893, follows the one beginning "De aptatione medicinarum…" (no. 58c) has the incipit "De lapide qui in renibus vel vesica formatur.…" The work printed with the incipit "Dixit Rasis. De lapide qui in renibus vel vesica formatur" in the Leiden, 1510, edition (fols. 278-279) under the title *Tractatus Rasis de preservatione ab egritudine lapidis,* may be a version by Gerard of Cremona of another well-known work by al-Rāz. See GAS. Ill, 288, no. 26; Ullmann, 134.

A work in Latin translation entitled *Aphorismi Rasis,* in six chapters and containing well over 300 aphorisms. was printed anranc the works of al-Rāzī, in the early editions, Wüstenfeld suggested Gerard as a translator of these, as well as of the other works by al-Rāzī in these editions, although they were not included in the *socii* list. Sezgin (III, 284, no. 7) identifies the Latin *Aphorismi Rasis* with an Arabic original *Kitāb al-Murshid* or *Kitāb al-Fusūl* although he does not suggest Gerard as a translator. Ullmann (pp. 134- 135) describes this *Kitāb al-Murshid* ("Der Führer") as a late work by al-Rāzī that consists of 377 aphorisms in 37 chapters, but he does not mention a Latin translation of it. The original Arabic was published by A. Zaki Iskandar in *Revue de I'lnstitut des manuscrits arabes* (Cairo) **7** (1965) 1-125 In Latin, the work was published sometimes with the other Rāzī translations by Gerard of Cremona, sometimes in a collection of *Aphorisms* headed by the *Aphorismi Raby Moyses* (Maimonides). In all these editions it has approximately the same title, prologue, and incipit as the *De secretis medicine secundumRasim* studied by Thomdike (1958) in Paris, BN lat. 17847, where it begins: "Inquit Abubecri… Congregavi in divisionibus egritudinum et ostendi curas et causarum.…" This text, however, is not included among the tightly knit group of works by al-Rāzī translated by Gerard of Cremona. On the contrary, in Paris, BN lat. 17847, as observed by Thomdike, it is said to be translated by a "Mag-ister Egidius apud sanctam habenam," whom Thorndike does not identify fürther. Thorndike's observation, based on manuscript tradition, does away with Wiistenfekd's hypothesis based on printed texts. It would seem, therefore, that there is positive proof that the *Aphorismi Rasis* was not translated by Gerard.

59[77]. Ibn al-Wāfid (Abenguefit), *Liber medici-narum simplicium et ciborum*. Ibn al-Wāfid was a physician of CÒrdoba who died in 1075, according to Wüstenfeld (p. 72); a vizir at Toledo who died after 1068, according to Ullmann (*Die Medizin,* 210); and in 1068, according to Sezgin (III, 228). *See GAS,* III, 228-229; Ullmann, *Die Medizin,* 210 and 273; Max Meyerhoff, "Esquisse d'histoire de la pharmacologic et botanique chez les musul-mans d'Espagne," in *al-Andalus*.**3** [1935], 13 ff. The Liber medicinarum simplicium was printed at Strasbourg in 1531 with Ibn Butlan's [Elluchasem Elimitharl Tacuini sanitalis (see Ullmann, Die Medizin, 157-158) and at Venice in 1558 with Mesnë.

60[70]. Yahyā ibn Sarāfyūn (Filius Serapionis), *Breviarius Iohannis Serapionis tract. VII better known as Practica Serapionis. See GAS,* III, 241,no. 2; Ullmann, 102-103. Printed at Venice in 1497 and reprinted several times. Ullmann gives a description of the contents from the Lyons, 1525, edition.

61[75]. Abu'I-Qāsim (Abulcasis) al-Zahrāwī, *De cirurgia, tres tractatus*. Of the thirty component parts of this enormous work, only the last part, dealing with surgery and its instruments in three books, was translated by Gerard. The original Arabic is profusely illustrated in manuscripts and was published with English translation by M. S. Pink and G. L. Lewis, *Albucasis* on Surgery and Instruments. *A Definitive Edition of the Arabic Text with English Translation and Commentary* (London, 1973). *Also see GAS,* III, 323-325, and V, 414 (*Nachträge*): and Ullmann, 149- 151. The Latin was printed at Venice in 1487 with the *Chi-rurgia* of Guy de Chauliac.

62[68]. Al-Kindi, *De gradibus*. A work on phar macology. Latin text edited by Michael R. McVaugh, *Arnaldi de Villanova Opera medica omnia, II, Aphorismi de gradibus* (Granada-Barcelona, 1975), 263-295. *GAS,* III, 245; Ullmann, 302; Carmody, *AAAL,* 84-85.

63[76]. Ibn Sīnā [Avicenna], Canon. Fifteen editions by 1500 and as many after that. First Arabic edition issued by the Medici Press (Rome, 1596). See Ullmann, 152-154. English extract in E. Grant, ed., A Source Book in Medieval Science.

64[78]. Galen, *Tegni* [*Microtegni or An parva*], *cum expositione Ali ab Rodohan* (cAlī ibn Ridwān). See *GAS,* III, 81; Ullmann, 45; Durling,' 463; Diels, 61-63. It is at the end of this work that the manuscripts usually contain the *socii* list of Gerard's works that we are following here, after Wüstenfeld. Concluding the list of Gerard's medical translations and nearly at the end of the entire list, the *Tegni* with Ibn Ridwān's commentary is named in the *vita* as among the last works translated by Gerard (*novissime ab eo translati*). This statement seems to imply a chronological order in the list, at least as far as the medical works are concerned. Durling, 463; Diels, 61-63.

F. Works on alchemy (3 works).

65[84]. [Jābir ibn Hayyān], *Liber divinitatis de LXX*. Published by M. Berthelot in *Archéologie et histoire des sciences* (Paris, 1906). Renaldus Cremonensis (Wustenfeld, 74) seems to be a misreading or a scribal misspelling of Gerardus Cre monensis. At least, the *socii* list is explicit about Gerard's translation of this work, and no other translator of it is known; a Renaldus Cremonensis as translator also is unknown

66[85]. Pseudo-Rāzī [?], *De aluminibus et sali-bus*. Incipit *TK* 677. Edited by R. Steele in *Isis,* 12 (1929), 14-42. See J. Ruska, *Das Buch der Ataune and Satze; ein Grundwerk der spät-lateinischen Alchemie*(Berlin, 1935); and "Pseud-epigraphe Rasis-Schriften/' in *Osiris,* 7 (1939), 30-93. See Ullmann, *Die Natur-…,* 210-213, 228; *GAS,* IV, 282. Wüstenfeld, following Stein-schneider, holds that because the words" apudnos in Yspania' appear in this text, the author cannot be the famous physician al-Rāzī, who never was in Spain. We must observe, however, from a limited practical experience with medieval alchemical manuscripts, that alchemists, who often were their own scribes, used these texts to inform each other of their accomplishments or of some other alchemist they knew or had heard about. These conditions may render invalid any criterion of textual authenticity based solely on such incidental remarks.

67 [86]. Pseudo-Rāzī, *Liber luminis luminum*. Incipit TK 290: "Cum de sublimi . ." (TK says this translation is by Raymond of Marseilles). The original is ascribed to al-Rāzī in Gerard's translation. In the edition by B. Rhenanus, *Harnomia* (Wüstenfeld, p. 75). the author is named Rases Castrensis. This may very well be a misreading of a manuscript ascription to R[obert] Castrensis, or Robert of Chester (ca. 1140), who is known to have made alchemical translations from the Arabic. Citations of this kind in early printed editions cannot be decisive as to the authenticity of the manuscript tradition: only careful examination of the entire manuscript tradition could be conclusive in such cases.

G. Works on geomancy and divination.

68 [87]. *Liber geomantie de artibus divinantibus qui incipit: Estiniaverunt Indi*. Also translated by Hugh of Santalla [?]. See Carmody, *AAAL,* 173. But is this a translation or an original work by Gerard? *TK* gives three different incipits of a geomancy ascribed to Gerard of Cremona, not specifying whether it is a translation or an original work, but with a question mark next to two of them.

TK 697: "In nomine illius qui maior est incipit geomancia…" Gerard of Cremona.

TK 1446; "Si de statu corporis questio proponatur utrum meliorari…" Gerard of Cremona (?), Geomancia.

TK 1461: "Si quis per artem geomanticam de preteritis, presentibus et futuris…" Gerard of Cremona (?). *Geomancy*.

On the other hand, the work beginning "Estimaverunt indi." stated in the socii list to be a translation by Gerard, is listed by both *TK* and Carmody, *AAAL,* 173, as translated by Hugh of Santalla. Hugh of Santalia is known exclusively as a translator from the Arabic; if he translated this geomancy, then the original must have existed in Arabic. On the other hand, if the *socii* list is to be believed—as surely it must, in view of the great reliability of the remainder of the list —then what happened to Gerard's translation, or original work? If the *Geomancy* currently ascribed to him is not his (printed at Paris 1661 in a French translation by "le sieur de Salerne" there nevertheless are manuscript copies of a geomancy that clearly credit Gerard as author (Wustenfeld, 75). This geomancy by Gerard often has been ascribed to the other Cremonensis. Gerard of Sabbioneta—but with no medieval authority, and on the same grounds as for the authorship of the *Theorica planetarum*.

69 [79]. *Liber Alfadhol i. est arab de bachi*. A book on lots and fates determined by questions and answers. The identity of the author indicated as "arab de bachi" (with variants ".i. tharab," or "de brachi," or "z d harab de bachi": see Wüstenfeld, 75) should be read much more simply, it seems, as "an Arab from Balkh" (*arab de balchi*). Astrologers and occultists related to the city of Balkh were numerous in the classical period. On the other hand, some Latin manuscripts carry the additional identification of Alfodhol de Meregi, Alfodhol de Merengi, or Aralfodhol de Merengi. Wüstenfeld (p. 75) proposed to read it as a corruption of al-Nayrīlī (already corrupted into Tabrīzī Yazīdī in some important sources), a well-known commentator on the *Almagest* and on Euclid, because this author's name happened to be al-Fadl; but the passage from al-Nayrīzī to de Merengi appears a bit farfetched. It seems much more natural to read *de niranji, or nayranji*, a frequently used term of Persian origin for books of magic, and magic is really the subject of this book. See M *Ullmann, Die Natur-mid Geheimwissenschaften im islam*. 360, 362, 363, 366, 367, 375. 376. 393.

See P. Kunitzsch, "Zum Liber alfadhol." eine Nachlese, "in *ZDMG*, **118** (1968), 297-314. which is an appendix to a German edition and version by B. F. Lutz, *Das Buch 'Alfado,' Untersuchung and Ausgabe nach der Wiener Hds. 2804* (Heidelberg, 1967), with bibliography. Kunitzsch points out the existence of a two-fold Latin manuscript tradition, only one of which may be called a direct translation. He confesses to being unable to decide which of the two groups of text should be ascribed to Gerard of Cremona. The Arabic tradition also varies considerably, with fanciful attribution of authorship to al-Kindī or to Caliph Harun al-Rashid, No manuscript of the Arabic text known to Kunitzsch mentions al-Fadl ibn Sahl al-Sarakhsī as the author, while the Latin text, presumably by Gerard, is specific on this name.

70 [83]. *Liber de accidentibus alfel*. A book of auguries and omens. See H. Suter, "Über einige noch nicht sicher gestellte Autorennamen in den Übersetzungen des Gerhard von Cremona," in BM, 3rd ser.,**4** (1903), 25.

71 [45]. "Arib (not Harib, as in McVaugh, which is a Jewish form) ibn Sa'd al-Kātib al-Qurtubī" (secretary to Bishop Rabi ibn Zaid of CÒrdoba), *Liber anoe*. A work on calendar and agricultural usages, dedicated to al-Hakam II, caliph of Cordoba (961-976). Editions by G. Libri, *Histoiredes sciences mathématiques en Italie*, I (1838). 293-458 (correct McVaugh's 393); by R. P. A. Dozy, *Le calendrier de Cordoue de l'annee 961* (Leiden, 1873); and by Charles Pellat, *Le calendrier de Cordoue* (Leiden, 1961), with French translation.

H. Additional translations ascribed to Gerard and not on the *socii* list.

Both Boncompagni and Wustenfeld agreed that medieval Latin tradition credited Gerard with more translations than are found in the socii list. Wustenfeld's additions are included in Sarton's expanded list, with the exception of some works by Ibn Sīnā (Wüstenfeld, 78); likewise, most of Bon—compagnfs additions are included in Sarton's list, the only omissions being Ibn al-Haytham's *Per—spectiva* (Boncompagni, 408-409) and the *Alcha—bitius* (Boncompagni, 443). The latter work had already been translated by John of Seville; and if Gerard really did translate it again, it must have been a reworking, as were so many other of his early efforts in translation.

The story of the medieval Latin *Alchabitius* is extremely involved, since this work came to be included in the curriculum of some teachers of astronomy—astrology—medicine;[26] hence its manuscript tradition is very complicated, and no conclusive statement on Gerard's possible contribution can yet be made. The omission of Ibnal—Haytham's *Perspectiva* from Sarton's list, however, is important; and it is difficult to understand Sarton's rationale in this case. Although it seems likely, it is by no means certain that Gerard was the translator of the *Perspectiva*. We shall give here in brief summary the additional items on Sarton's list, which includes nearly all ascriptions of Latin translations from the Arabic credited to Gerard of Cremona (Sarton's numbering is in square brackets).

[8].*Liber lapidum,* an anonymous work quoted by Arnold of Saxony (ascribed to Aristotle).

[11, 13, 14]. These correspond to Wustenfeld's nos. 39a, 39c, and 39d, respectively.

[15]. Alexander of Aphrodisias, *De unitate*. In Paris, BN lat. 6443, fol. 193r, it is ascribed to Alexander in the title but to al-Kindī in the colophon.

[18]. Al—Kindī, *De ratione*. See A Nagy, ed., *Beiträge*. 2. no. 5 (1897), 2-11.

[27]. Apollonius, *De conicis*. Gerard unquestionably translated a fragment of book **I** of the Conies. which he used as introduction to his translation of Ibn al—Haytham's *De speculis comburentibus*. The fragment of the *Conics* translated by Gerard was published by Heiberg in his edition of the *Conics***II** (Leipzig, 1893), Ixv-Ixxx.

[43]. Abū Kāmil, *Liber de algebra et almucaba—la*. See L. Karpinski, *Robert of Chester's Latin Translation*. M 2nd ed. (Ann Arbor, 1930), 19-20; and M. Levey, T*he Algebra of Abū Kāmil* (Madison, Wis., 1966),9-10.

[48]. *Algorismus de integris*. This is perhaps a translation (probably a new version) of al-Khwārizmī's Arithmetic in one of the many Latin adaptations of this famous Arabic text (now lost). A. Allard of Tourpes, Belgium, is presently working on the problem of the medieval algorism; and his research may throw light on the various versions of Al—Khwārizmīs *Arithmetic* among Latins and Greeks.

[49]. *Liber co—aequationis planetarum*. It is unclear which of the several astronomical works ascribed to Gerard in manuscripts (see Wustenfeld, 78-79) corresponds to this title given by Sarton, after Steinschneider ("Die europäischen Überset—zungen").

[51]. Al-Zarqālī, *Canones*. Rules for the use of astronomical tables, compiled by the Toledan astronomer Zarqālī (Azarchel) about 1070. Zarqālī also drew up the Toledan Tables to accompany these *Canones*. *The Canones* of al-Zarqālī were very popular until they were superseded in the fourteenth century by the Alfonsine Tables.[27] Some manuscripts of the translation of the Canones named Gerard as the translator; it seems that he translated only the *Canones* and not the tables, although he may have composed tables of his own, either for the meridian of Toledo (Boncompagni, 445) or for the meridian of Cremona. See M. Rei—naud, *Géographic d'Aboulféda*,**I** (Paris, 1848), ccxlvi-ccxlviii, according to whom MS Paris, BN lat. 7421, contains the *Theorica planetarum* ascribed to Gerard of Cremona (fol. 131) immediately after the tables of al—Zarqālī "translated by Gerard of Cremona" (fol. 100). On the Toledan Tables in general, see G. J. Toomer, "A Survey of Toledan Tables," in *Osiris*, **15** (1968), 5 - 174.

[52]. *Liber omnium sperarum caeli et composition's tabularum*. The same authenticity problems as for no. 51. Wüstenfeld (p. 78) lists it as a translation under the title *De compositione sphaerae*. The possibility that this could be an obscure designation for the *Theorica planetarum,* which is now generally removed from Gerard's list of original works, will be discussed when we deal with Gerard's original works.

[67]. Galen, *Tegni*. Sarton lists separately this work by Galen that is included, with 'Alī ibn Riḍwān's commentary, as no. 64 in the socii list. He later lists the commentary by 'Ali as [78].

[69] Ibn Māsawayh (Mesue), *Aphorisms*. See Ullmann. *Die Medizin…,* 113; *GAS,* III, 233 (ascribed to Johannes Damascenus by Constantine the African). Edited by P. Sbath (Cairo, 1934).

[81]. (Alchandrus]. *Arcandam de veritatibus et praedicationibus astrologicis*. It is very doubtful that Gerard translated this simplistic astrological work of which some manuscript copies of the tenth and eleventh centuries exist (Paris, BN lat. 17868 [10c] and London, BM Add. 17808 [lie]); see Lynn Thorndike, *A History of Magic*. I (New York. 1923). 710 ff. On *Arcandam,* see A. van de Vyver. "Les plus anciennes traductions latines…." in *Osiris,* 1 (1936), 658-691. Sarton probably confused or misread Alchandreus in Boncom-pagni's suggestion to add Alchabitius to the list of Gerard's translations.

[82]. Abhabuchri [Heus], *Liber in quo terrarum corporumque [caelestium(?)] continentur mensura-tiones Abhabuchri*. Wüstenfeld, 79. See H. Suter, "Über einige noch nicht sicher gestellte Autoren-namen…," 19-20; *GAS,* V, 389-390; edited by H. L. L. Busard, "L'algèbre au moyen âge: Le 'Liber mensurationum' d'Abu Bekr," in *Journal des savants* (Apr.-June 1968), 66- 124.

A last important addition may be the *Perspectiva (De aspectibus)* of Ibn al-Haytham. See A. Jour-dain. *Recherches critiques sur les anciennes traductions latines d'Aristote* (Paris, 1843; repr.. New York, 1960). Carmody, *AAAL,* 139-140: D. Lindberg, "Alhazen's Theory of Vision and Its Reception in the West," in *I sis*. 58 (1967). 321-341.

As already shown, the *socii* list is not exhaustive. Certainly the *socii* strove for completeness, but Gerard's long career and his reluctance to sign his work help to explain the limitations of their list. The socii, who apparently belonged to a circle of collaborators late in Gerard's life, simply were ignorant of the details of his early years as a translator. Gerard most certainly was not the originator of the list —not even in imitation of Galen at the end of the *Tegni:* it was the socii who found in Galen's practice the justification or inspiration to draw up the list as best they could.

Arab scholars interested in sciences seem to have created or inherited collections of basic works in the various branches of the *quadrivium* that students in each field had to master. The fact is fairly clear in the case of mathematical and astronomical works, as shown in the studies of M. Steinschneider ("Die mittleren Bücher…") and F. Carmody (*Thābit* [1960], 22). Similar pedagogical collections of required works in medicine probably were inherited by the Arabs from the *Sum-maria Alexandrinorum* (M. Ullmann, *Die Medizin…*, 65-67; GAS, III, 140-150), to which active physicians and writers like Ḥunayn ibn Isḥāq and al-Rāzī seem to have added significantly. It would seem that Gerard of Cremona sought out such collections, particularly in mathematics, astronomy, and medicine, in order to translate them as a corpus in each branch of the *quadrivium* for the large number of his translations in those fields frequently agrees with the order of those Arab scientific collections.

Among the Latins, perhaps even directly under the influence of Gerard of Cremona, similar collections were valued and new ones, especially astrological translations from the Arabic, were assembled. In 1902 A. A. Bjornbo discovered, in the Paris manuscript BN lat. 9335, which contains some twelve translations by Gerard of Cremona, the direct statement by Hunayn ibn Ishaq on the subject of those "mittleren Bücher" (BM, 3rd ser., **3** [1902], 68). The following year, Björnbo published (*ibid.*,**4** [1903], 288-290) a very interesting specialized program of study in mathematics-astronomy that he was certain corresponded to some university curriculum, although he could not positively identify the university. The parallelism between this curriculum and the Hunayn extract is obvious, in the inspiration if not in the detailed series of works. Although medicine was not part of the *quadrivium,* it was in this field that Gerard produced the greatest number —and his best — works. He translated at least twenty-one medical writings, among them Ibn S'na's Canon and al-Rāzī's *Almansorius*. Consequently, his translations had an immeasurable impact upon Latin medicine of the Middle Ages, which profited greatly from the advanced state of medicine in medieval Islam. Second in importance in number and quality were his translations in geometry, mathematics, and astronomy, totaling some thirty works. Here again. Gerard's translations influenced the strivings of Latin scholars toward a scientific approach to knowledge of nature that subordinated philosophical and theological inclinations. Six additional works on geomancy and alchemy also contributed largely to the scientific orientation of the medieval West. Gerard's eleven translations of works in philosophy and three on dialectics appear to have had a rather minimal influence; they seem to have been selected for their relevance to the epistemology of natural science and to a scientific interpretation of the cosmos.

During the thirteenth century, the *parens scientiarum* of the era, the University of Paris, after the prohibition of Aristotle's work and of Arabic learning in 1210-1215, turned toward philosophical and theological speculation, although the consequent Scholasticism always had room for physical and cosmological considerations. The evolution of the university curriculum during the thirteenth and fourteenth centuries reveals the slow but sure penetration of many of Gerard's translations, which nourished the awakened interest in natural science until the end of the Middle Ages. Although the Renaissance infatuation with Greek texts at the expense of their Arab counterparts perhaps exerted a delaying action that began at the end of the fourteenth century, one can still observe among the luminaries of the "new science" at Oxford, Paris, and Padua a reliance on some of the texts produced by Gerard. Regiomontanus' scathing indictment of the *Theorica planetarum* reveals that it was still used largely as an introductory book by students of astronomy. Gerard may have written this text, although its authorship has been widely disputed. Still, the first Latin *Almagest* to be printed (Venice, 1515) was Gerard's, of which it seems that Copernicus soon procured a copy.

Gerard of Cremona's Original Works There is still much uncertainty about the number, value, and even the existence of Gerard's original works Aware of the incompleteness of the socii list and impressed by the number of manuscript ascriptions of works to Gerard, Wustenfeld (pp. 79-80) added several allegedly original works, including two medical glosses on works by Ishaq al-Isra: his *Viaticum* and his *Diaetae universales* (see GAS, III, 296-297), and a *Summa de modo medendi et ordine curandi*. Nevertheless, Wustenfeld held that Gerard did not compose the celebrated *Theorica planetarum* and the *Geomantia astronomica*, attributing both to Gerard of Sabbioneta on the strength of G. Tiraboschi's and Boncompagni's argumentation, which is based on three equally weak and unsound premises: the absence of this work in the *socii* list; the "doctrinal meagerness and linguistically inappropriate" style of the *Theorica*; and the arbitrary selection of the insignificant astrologer Gerard of Sabbioneta (near Cremona) as the probable author, without any medieval testimony for this. But this theory is severely flawed, for the original *socii* list never made any claim to completeness. Moreover, the list refers exclusively to "translations"—the primary role of Gerard in the service of his "beloved" Christendom. Occasional minor works composed by Gerard, especially in fields where his reputation as a translator was so eminent, were certainly of secondary importance to the *socii*— if they were even aware of their existence.

Olaf Pedersen holds (see E. Grant, *A Source Book in Medieval Science*) that the *Theorica planetarum Gerardi* dates from the middle of the thirteenth century. Yet, one little-observed manuscript of Spanish origin, now preserved in Leningrad at the Library of the Academy of Sciences, Codex XX, Ab-III (present shelf mark F.N°.8), already described by Sangin (*CCAG*, 12, 205-229), contains translations of astronomical and astrological works by Gerard of Cremona and by John of Seville in its

older portion that apparently dates from the late twelfth century (Sangin said thirteenth-fourteenth century; but we saw the codex in August 1974 and the first portion is definitely of the late twelfth century: on folio 77 it has a world horoscope dated 13 March 1178). On folios 13r-18r it contains the *Theorica planetarum*, here formally ascribed to Gerard of Cremona in a collection of translations by him and by John of Seville. This copy may date from the lifetime of Gerard of Cremona and may have originated in his circle. In 1959 Thorndike ("John of Seville," in *Speculum*. 34 [1959], 31-32) noted two fifteenth-century manuscripts of the *Theorica* bearing the ascription to John of Seville. There is, in fact, a distinct possibility that, like so many other cases of close relation between John's and Gerard's translations, the *Theorica planetarum* may have originated with John of Seville, whose style it matches perfectly, and was reworked in some fashion by Gerard of Cremona.

There is little to be added concerning the quality of Gerard's translations. Beginning with the Renaissance and through the early centuries of printing, the criticisms of his rendering of his Arabic models were many and harsh. These criticisms, however, rarely took into account the long period of manuscript transmission prior to the invention of printing that rendered Gerard's works so susceptible to scribal errors. Moreover, none of the critical comments has accused Gerard of mistranslating from the Arabic, simply because no scholar has compared his translations with the Arabic. This double task, advocated by Wūstenfeld in 1877 (p. 80), has not yet even been attempted.

NOTES

1. C. A. Nallino, "Il Gherardo Cremonese autore della *Theorica planetarum* deve ritenersi esse Gherardo Cremonese da Sabbioneta," in *Atti dell'Accademia dei Lincei Rendiconti*. Cl. di sci. mor., stor. e fil., 6th ser., **8** (1932), 383-404; repr. in Maria Nallino, ed., *Raccolta di scritti editi e inediti*, VI (Rome, 1948), 304-320-see 307, n. 2.

2. Text in F. Wustenfeld, "Die Übersetzungen arabischer Werke in das lateinische seit dem XI. Jahrhundert," 77; also in B. Boncompagni, "Della vita e delle opere di Gherardo Cremonese, traduttore del secolo duodecimo, e di Gherardo da Sabbionetta astronomo del secolo decimoterzo" in *Atti dell'Accademia pontificia dei Nuovi Lincei*, **4** (1851), 387-493, also published separately (Rome, 1851), 3-109. In his recent English trans., published in E. Grant, ed., *A Source Book in Medieval Science* (Cambridge, Mass., 1974), 35-38, Michael McVaugh omitted this section.

3. L. Muratori, *Rerum italicarum scriptores*, IX. 600.

4. Francisco Arisi, *Cremona literata, seu in Cremonenses doctrinis et literariis dignitatibus eminentiores chronologicae adnotationes*, I, 269-273.

5. K. Sudhoff, "Die kurze 'Vita' und das Verzeichnis der Arbeiten Gerhards v. Cremona, von seinem Schülern und Studien genossen kurz nach dem Tode des Meisters (1187) zu Toledo verabfasst." refers to Boncompagni's and V. Rose's studies but ignores that of Wustenfeld. Sudhoff claims to have searched MSS of the trans. of the *Tegni* for new copies of the *vita* and list: he says he has found three in addition to the Vatican MS used by Boncompagni. Two of the new MSS are those used (and presumably discovered) by Wustenfeld thirty-eight years earlier (MSS Leipzig 1119 and 1148). In presenting his "new" text from these four MSS. Sudhoff committed all the scribal errors rejected by Wustenfeld. The fourth MS was cited by V. Rose in 1874.

6. V. Rose, "Ptolemaeus und die Schule von Toledo," in *Hermes*, **8** (1874), 327-349, esp. 347-349. The Erfürt MS of Sudhoff is cited on p. 334. n. 2.

7. See R. Lemay, *Abū Ma'shar and Latin Aristotelianism in the Twelfth Century*, (Beirut, 1962), 315.

8. Since M. McVaugh's English trans. (1974) is now easily available. we shall refer to it as a rule and mark only occasionally the need for closer interpretation by reference to the Latin text of Wustenfeld.

9. See Boncompagni. op. cit., 397; sep. printing, p. 12.

10. See Rose, op cit., 349. Also K. Sudhoff's ed. in *Archiv für die Geschichte der Naturwissenschaften und der Technik*, **8** (1918). 1-40, with better variants offered by A. Birkenmajer, *ibid*., **9** (1920), 46-51.

11. S.D. Wingate, *The Mediaeval Latin Versions of the Aristotelian Scientific Corpus* (London, 1931), 46, suggests a year as early as 1134, which would give Gerard fifty-three years of activity in Toledo, a still more plausible situation. This early date, if it could be more securely based, would carry tremendous importance for Gerard's training in Arabic. The year 1133 is the date of the completion of John of Seville's translation of Abū Ma shar's *Liber maioris introductorii*. John is known to have been active in translating, both on his own and for Archbishop Raymond, for at least a decade after that. This raises the strong possibility of direct contact between Gerard and John of Seville, his model as a translator.

12. In doubting Gerard's authorship of any number of translations because of this incredibly large output, Sarton did not consider the time factor. There is nothing inherently impossible in Gerard's direct authorship of so many translations if he had

spent more than forty or even fifty years in that work. As his biography states, he was a very industrious worker throughout his stay in Toledo.

13. See Wingate, *op. cit.*, 46 and references.

14.*Hermes*, **8** (1874), 335 and 336. n. I. We doubt, however, that this collaboration with a native Spaniard was necessarily done "in mündlichem Dictate," as Rose states, taking his example from Rudolf of Bruges. This process clearly prevented the Latin collaborator from working directly with the Arabic text. Such a situation, if probable for Rudolf, who made very few translations, is quite unthinkable for Gerard of Cremona.

15. See the extreme claim made by M. T. d'Alverny, "Deuxtraductions latines du Coran au moyen âge," AHDLMA, **22-23** (1947-1948), 69-131, esp. 85, n. 3, and 114.

16.*Séville musulmane au début du XIIe siècle: Le traité d'Ibn 'Abdūn*, translated and annotated by E. Levi-Provencal (Paris, 1947), 128. See R. Lemay, *Abū Ma'shar*, 15, n. 1.

17. I. Opelt, "Zur Übersetzungstechnik des Gerhard von Cremona," in *Glotta*, **38** (1959), 135-170, is a valuable effort concentrating on a single work. Yet the results, embodied in a series of suggested criteria (pp. 138-151) for determining Gerard's characteristic manner, can only be weakened by the lack of comparative approach with other possible translations. This may be the case with the *De caelo et mundo*, the object of Opelt's attention. The weakness of Opelt's approach shows even more in the final glossaries; her glossary of Arabic terms contains only thirty entries, whereas the glossary of Greek-Latin terms (surely of little direct concern to Gerard) contains 600 terms. Gerard patiently and earnestly worked with all of his Arabic texts, an effort that does not appear in Opelt's analysis, at least not clearly enough. L. Minio-Paluello made a more direct examination of Gerard's technique in relation to the Arabic in *AL*, 2nd ed., L. Minio-Paluello and B. G. Dod. eds., I (Bruges-Paris, 1968), 1-4, containing Aristotle's *Analytica posteriora* [no. 1 on Wüstenfeld's list]: see esp. pp. lilxv, which contain results indicating the soundness of this approach.

18.*AL*. 1. 16 and 197-198; II. index, under Qustā ibn Lūqā and M. A. Alonso, "Traducciones del Arabe al latin por Juan Hispano (Ibn Dawūd)," in al-Andalus, **17** (1952), 134-139. Alonso's information should always be used with caution. These studies conclude that there were two translations of this text, one surely by John of Seville and the other anonymous. E. Bertola, however, after a close comparison with several MSS of this Latin text, believes that there was only one translation, with scribal variants: E. Bertola, "Le traduzioni delle opere filosofiche arabo-giudaiche nei secoli XII e XIII," 269. The criteria proposed above for distinguishing Gerard's in relation to earlier translations seem to be directly applicable here. The difference in the two incipits of Qustā ibn Lūqā's Latin translations shows that John of Seville's version omitted the typically Muslim clause of "honorificet te Deus," which the other version restored. Since this is exactly Gerard's manner in his new versions, it would seem that the "anonymous" version should definitely be ascribed to him.

19. M. McVaugh is to be commended for having returned to the *socii* list in his recent English trans. of the *vita* and bibliography in E. Grant, ed., *op. cit.*. 35-38.

20. Minio-Paluello's hesitatn suggestion that Gerard might have known Greek and done translation from this language in southern Italy before going to Toledo—"Note sull'Aristotele latino medievale," in *Rivista di filosofia neoscolastica* (RFNS), **42** (1950), 227-228-was rejected by A. Mansion, AL, VII, 2 (1957), vii-viii.

21. See Wustenfeld, *op. cit.*; Boncompagni, *op. cit.*; Sudhoff, *op. cit*. Now in English in M. McVaugh (see n. 19).

22. See Manuel Alonso Alonso. "Al-qiwām y 'al-aniyya' en las traducciones de Gundisalvo," in *al-Andalus*,**22** (1957). 377-405.

23. Such as the work sometimes attributed under this title to Gilbert de la Porrée. See also H. Silverstein. "Liber Hermetis Mereurii triplicis de VI rerum principtis," in *AHDLMA*, 30 (1955), 217-302. for a parallel twelfth-century source from translations of Hermetic works.

24.*Domingo Gundisaivo, De Scientüs texto latino Manuel Alonso Alonso*, ed. (Madrid—Granada, 1954). See J. T. Monroe. *Islam and the Arabs in Spanish Scholarship (Sixteenth Century to the Present)* (Leiden. 1970). 229.

25. Plagiarism was hinted at by Alonso when he edited *Hermann de Carinthia, De Essentüs* (Santander, 1946). in which he showed that Gundissalinus' *De processione mundi* took entire paragraphs from Hermann's work.

26. By Robert le Normand at Paris in 1358. See Henri Denifle and Emiie Châtelain, *Charttdarium Universitatis parisiensis. Auctarium,* I (Paris. 1889). col. 225. Other allusions to teachers of astrology at Paris are in *Chartularium,* III (1894), 265, 449; they concern Johannes Durand, "scolaris in medicina in secundo anno et [legens] Parisius astrolo-giam ex prccepio domini regis." in Bologna the statutes of 1405 for the Faculty of Arts and Medicine also contain mention of *Alchabitius* as a text for students of medicine. See Malagola 276, translated in L. Thorndike, *University Records and Life in the Middle Ages* (New York, 1944), 279-282. It may be suspected that in addition to the original *Akhabitius,* either in the trans, of John of Seville or

that of Gerard of Cremona, the students of medicine also used the commentary (*Liber isagogicus*) completed at Paris in 1331 by John of Saxony. See Simon de Phares. *Recueil des plus (celebres astrologues . . .,* Ernest Wickersheimer, ed. (Paris, 1929). 256. Simon recalls that in his youth (*ca*. 1460) he went to Paris "en la rue du Feurre [seat of the Faculty of Arts] ou je aprins *De spera et* mes introduc-toires de l'Acabice."

27. Originally composed at the court of Alfonso el Sabio in Toledo. *ca*. 1255-1260, but introduced after important modifications at the University of Paris about 1335. E. Rosen is preparing a study on the fate of the Alfonsine Tables in the medieval universities.

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The following abbreviations are used:

AHDLMA. Archives d'histoire doctrinale et littéeraire du moyen âge.

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