Greek into Arabic

The transmission of Greek learning to different linguistic areas and subsequent ages was a process of momentous importance in the history of ideas. As exemplified by Boethius (d. 525 CE), translations of Greek philosophic and scientific works began at the end of Antiquity to counter the loss of the Graeco-Latin bilinguism of the Roman Empire. In the 6th century appeared also translations from Greek into Syriac. Then the Graeco-Arabic translations came to the floor: they play an important role both in themselves and as the starting point of the philosophical and scientific literature in Arabic. The Muslim scholars of the classical age clearly recognized that philosophy and the sciences (*ʿulūm al-awāʾil*, "the sciences of the Ancients") were non-Islamic in their origin, as detailed by Endress (Wissenschaftliche, 400) through the examples of Ibn al-Nadīm (d. 380/990), Ibn Khaldūn (d. 808/1406), and others. Greeks were praised for their learning. Although well aware that other peoples too developed various sciences, Ṣāʿid al-Andalusī (d. 463/1070) in his *K. al-Taʿrīf bi-ṭabaqāt al-umam* (*Book of the information about the categories of the nations*) deems the Greeks to have brought knowledge to its highest point. He says: "The language of the Greeks (*Yūnānīyūn*) is called Greek (*ighrīqīya*). It is one of the richest and most important languages in the world. As to religion, the Greeks are Ṣābians, that is, worshippers of the stars and idolaters. Their scholars used to be called philosophers (*falāsifa*). Philosopher (*faylasūf*) means in Greek 'friend of wisdom'. The Greek philosophers belong to the highest class of human beings and to the greatest scholars, since they showed a genuine interest in all branches of wisdom, mathematics, logic, natural science and metaphysics, as well as economics and politics" (trans. Rosenthal, *Heritage*, 39). The transmission of Greek learning covered many fields: philosophy in all its parts, astronomy, mathematics and optics, medicine, and the encyclopaedic sciences including, as was the case at that time, alchemy, physiognomic, and magic. The Muslim world obviously did not become acquainted with this legacy all at once, but in various stages during the 2nd-4th/8th-10th centuries. The present survey aims at accounting for both the diacronic and the systematic aspects of this *translatio studiorum*, and a synoptic view combining both will be provided in a chart at the end of this entry.

1. The first encounter: alchemy, encyclopedism, and the Syriac heritage of Greek philosophy and science.
2. Philosophy, astronomy, mathematics, and medicine: the translations of the early ʿAbbāsid age and the beginnings of scientific literature in Arabic.
3. Greek systems of knowledge in the Muslim world: Aristotle, Galen, and Ptolemy in the Būyid age and after.
4. The legacy of the translations in the Muslim West.
5. Greek into Arabic, Arabic into Latin.

1. Even though traces of Graeco-Roman inculturation have been detected in pre-Islamic poetry and in the Qurʾān itself, the first encounter of the Arabs with Greek learning predictably took place after the conquest of Syria (14/635) and the Umayyad settlement in Damascus (41/661). The cultivated

milieus of Syrian Christianity were acquainted with Greek philosophy and medicine: well before the rise of Islam the Christians of Syria had already moved from antagonism to assimilation of Greek culture (Brock, From antagonism). Following the lead of the philosophical school of Alexandria, where he had been educated, Sergius of Resh'aynā (d. 536 CE) set for himself the task of making Aristotle's logic available to his colinguals (Hugonnard-Roche, La logique). Sergius, who was both a prelate and the doctor-in-chief of Resh'aynā (Theodosiopolis), was interested not only in logic, but also in cosmology and medicine: his Syriac versions of the pseudo-Aristotelian *De mundo* and of a treatise on the cosmos by Alexander of Aphrodisias are extant; he also translated extensively the medical writings by Galen, as we are told by Ḥunayn b. Isḥāq (d. 260/873) in the account of his own translations of Galen (Bergsträsser; see also Degen). Not only Greek medicine, but also astronomy attracted the interest of the learned men of Syria: Ptolemy's *Almagest* was translated. After Sergius, the assimilation of Greek learning continued, with a prevailing focus on Aristotle's logic: the seminal studies by Baumstark and Georr have been substantially improved by Brock and Hugonnard-Roche. The latter lays emphasis on the influence of the late Antique model, with Porphyry's *Isagoge* premitted as an introduction not only to the *Categories* but also to the entire *Organon*. Porphyry's *Isagoge* was translated more than once into Syriac and was commented upon (Brock, The Syriac commentary). The scholarly work on the *Organon* continued after Sergius, as witnessed by Paul the Persian (fl. under Chosroes I, r. 531-578), Proba (6th century), Athanasius of Balad, Jacob of Edessa and George Bishop of the Arabs (7th-8th centuries). Syrian Christians were also acquainted with Greek psychology and ethics, with gnomologies and Neoplatonic metaphysics, the latter under the form of the theology of the enigmatic Dionysius the ps.-Areopagite: see the surveys by Brock (Syriac translations) and Hugonnard-Roche (Le corpus philosophique). In addition, there are Syriac translations of Greek works on some natural sciences broadly speaking: astronomy, geoponica, and alchemy. Also the Hellenistic legend of Alexander the Great, i.e. the so-called *Romance of Alexander* by the pseudo-Callistenes was translated into Syriac. This legacy prompted the first translations into Arabic. In his *Kitāb al-Fihrist* (*Book of the Catalogue*), Ibn al-Nadīm records that Mu'awiyya (r. 41-60/661-680) ordered some philosophers from Egypt to translate for him Greek and Coptic books on alchemy (*K. al-Fihrist*, 242.8-11 Flügel, trans. Dodge 1970, 581). Under the caliph Hishām b. 'Abd al-Mālik (r. 105-125/724-743) were translated into Arabic the pseudo-Aristotelian "Letters on government to Alexander the Great", that form the nucleus of the *Sirr al-asrār* (*Secret of the secrets*), the most famous "mirror for princes" combining encyclopaedism and the advice of a sage, Aristotle, to his royal disciple Alexander. To this age belongs also the Arabic translation of two pseudo-Aristotelian writings: the *De mundo* and *De virtutibus et vitiis*. Alongside with the rise in the Umayyad court of interest in alchemy and "mirrors for princes", the first encounter of the Arab conquerors with the culture of the conquered Syria resulted also in a certain exposure to Greek philosophy. It is worth noticing that the pseudo-Aristotelian writings whose Arabic translation has been mentioned above elaborate on two main topics touched upon in the "mirrors for princes": cosmology and ethics. On the other hand, under Umayyad rule and beyond the Christian scholarship of Syria continued to produce specialised works on Aristotelian logic, a tradition of learning that extended well into the 'Abbāsid age, in the 3rd-4th/9th-10th centuries.

2. In the first two centuries of the ʿAbbāsid dynasty, that ruled (in part only formally) between 132/749 and 656/1258, the translations into Arabic blossomed in the new capital Baghdad, founded in 145/762-3 by the caliph al-Manṣūr (r. 136-158/754-775). According to the historian al-Masʿūdī (d. 346/957), al-Manṣūr was the first caliph to have books translated for himself from foreign languages: al-Masʿūdī mentions the beast fable *Kalīla wa-Dimna* and the *Sindhind*, a mathematic-astronomical handbook of Indian origin (Endress, Wissenschaftliche, 415), together with Ptolemy's *Almagest*, Euclid's *Elements*, and Nicomachus of Gerasa's *Arithmetics*; some books by Aristotle on logic and other subjects are also mentioned (al-Masʿūdī, *Murūj al-dhahab*, § 3446 Pellat). This account is supported by the facts: *Kalīla wa-Dimna* was translated from Persian by a counsellor of al-Manṣūr, ʿAbdallāh b. al-Muqaffaʿ (d. 129/756), who dealt also with philosophy: an epitome of the first treatises of the *Organon* in its late ancient arrangement, which included Porphyry's *Isagoge*, has come down to us under his name. The successor of al-Manṣūr, al-Mahdī (r. 158-169/775-785) had Aristotle's *Topics* translated for him by the Nestorian patriarch of Baghdad Timothy I. During the first two centuries of ʿAbbāsid rule an impressive amount of philosophical and scientific works was translated, either directly from Greek or from Syriac versions of the original works. This flowering, after the seminal activity of translation done under the Umayyads, has been accounted for in various ways. Some ancient sources point to the policy of the first ʿAbbāsid rulers: so does Ibn al-Nadīm, to whom we shall come back in a moment. Others, still mentioning the caliphs' will, broaden their view to a general account of the transformations undergone by Islamic civilization. Ibn Khaldūn says: "The Muslims developed a sedentary culture. (…) Then, they desidered to study the philosophical disciplines. They had heard some mention of them by the bishops and priests among their Christian subjects" (Ibn Khaldūn, *The Muqaddimah*, trans. Rosenthal, 115). Ibn al-Nadīm devotes a chapter to "the reason why books on philosophy and other ancient sciences became plentiful in this country" (*K. al-Fihrist*, 243.1 Flügel, trans. Dodge 1970, 583), pointing to caliph al-Maʾmūn (r. 198-218/813-833) as being the instigator of the translations. The caliph, says Ibn al-Nadīm, was inspired by Aristotle himself, who appeared to him in a dream, giving instructions about the behaviour to adopt in his kingship. "This dream was one of the most definite reasons for the output of books" (*K. al-Fihrist*, 243.9 Flügel, trans. Dodge 1970, 584; the dream is recorded also in other versions). According to Gutas, the fiction was fabricated within circles closest to the caliph, as an item of "apologetic and tendentious historiography" intended "to justify al-Maʾmūn's rationalistic and pro-Muʿtazili policy" (Gutas, *Greek thought*, 101). Another view is that the ideological element admittedly at work in the fiction goes in the opposite direction: "the legend is an attack against the prevailing influence of rational science. Its origin should be located in conservative circles, viz. the followers of the line of Aḥmad ibn Hanbal" (Van Konigsveld, 360; for a balanced account, see Di Branco, Un'istituzione). Whatever the case, the narrative clearly reflects the fact that the ʿAbbāsid court was involved in the process of acquisition of non-Qurʾānic sciences. "The translation movement in the early ʿAbbāsid period was not a sideline affair conducted by few individuals (…) it was a massive movement which took place (…) under the protection and active patronage of the ʿAbbāsid rulers" (Sabra, Appropriation, 228; in the same vein Gutas, *Greek thought*). This

involvement is corroborated by an official mission sent to the Byzantine country in search for scientific books (*K. al-Fihrist*, 243.9-13 Flügel) as well as by the activities connected with the *bayt al-ḥikma* (House of wisdom). Scholars disagree about the nature of this institution, which has been described in ways as different from one another as an academy for translations and the private library of the caliph. The *Bayt al-ḥikma* had a director, Salm, who was appointed as the head of the mission mentioned above; he was accompanied by al-Ḥajjāj ibn Maṭar, the translator of Euclid's *Elements* and the revisor of the translation of the *Almagest*, and by Yaḥyā b. al-Biṭrīq, the translator of Plato's *Timaeus* and Aristotle's *De caelo* (Endress, Wissenschaftliche, 423-4). In his entry on the *Almagest*, Ibn al-Nadīm says in as many words that Salm, the director (*ṣāhib*) of the *bayt al-ḥikma*, supervised various scholars who had been entrusted with the revision of the translation of Ptolemy's work previously made for Yaḥyā ibn Khālid ibn Barmak (*K. al-Fihrist*, 267.29-268.3 Flügel), a fact that shows by itself that scientific translations were indeed connected in some way with the *bayt al-ḥikma* (Di Branco, Un'istituzione). The "House of wisdom" was indeed, as Endress has it, "a research centre on exact natural sciences, astronomy/astrology, and mathematics" (Wissenschaftliche, 426).

Predictably, the Greek works to be translated came from various places, not only in the narrow sense of the provenance of the manuscripts, but also in the broader sense of the traditions of learning that, at the end of Antiquity, organised the systems of higher education in the Graeco-Roman world. One way of transmission has been labelled as "von Alexandrien nach Baghdad" by the German Orientalist Max Meyerhof on the basis of an account by al-Fārābī (d. 339/950-951) which features also in other writers (the historian al-Masʿūdī and two physicians: Ibn Riḍwān, d. 460/1068, and Ibn Jumayʿ, d. 594/1198). In his lost work on the genesis of philosophy (partially known to us thanks to Ibn Abī Uṣaybiʿa, d. 668/1270), al-Fārābī outlines the transmission of learning from Alexandria to Antiochia, from Antiochia to Ḥarrān, and eventually to Baghdad. This account has been deemed fictitious on various counts, but the relationship it establishes between the philosophical school of Alexandria and the rise of Arabic philosophy and science can hardly be discarded as completely false. "The factual core of the Alexandria to Baghdad complex can be located historically in, or refers to, practices in Alexandria just before the Islamic conquest and the formation there of a canon of teaching or curriculum" (Gutas, Alexandria to Baghdad, 169). The fact that al-Fārābī mentions Ḥarrān, coupled with other bits of information, has led some scholars to make the transmission of Greek learning pivot on the "city of the Moon God" Ḥarrān, where, according to the 4th/10th century historian al-Masʿūdī, pagans performing planetary cults were still dwelling in his time and had a place for their meetings. He himself tells of a visit to a building with philosophical inscriptions of Platonic allegiance. Taking into account that some of the scientists and translators of the early ʿAbbāsid age came from Ḥarrān, as is the case with Thābit b. Qurra (d. 288/901), one may infer that there was a tradition of Greek learning there, mostly in astronomic and mathematical sciences. It has been contended that the Neoplatonic philosopher Simplicius (6th century CE) taught there after having left the court of Chosroes I, but this attempt at raising Ḥarrān to the role of the connecting point between late Ancient philosophy and the Arab world has not gained a firm footing in scholarship. Late Antiquity with its institutions of learning and conceptual patterns predictably fuelled the rise of science and philosophy in the Arab world, but it is also reasonable to assume

that various channels of transmission contributed to shaping the image of the disciplines, their basic texts, undisputed authorities, and fundamental doctrines.

As for the concrete acquisition of written documents, in addition to the official missions other ways are attested: some, like Ḥunayn b. Isḥāq, head out on long journeys in search of manuscripts; others, like Qusṭā b. Lūqā, reached Baghdad bringing books with them. A native of Baalbek, Qusṭā b. Lūqā (d. 298/910) was a Melkite Christian whose activity as a translator covered many fields: astronomy (there are translations by him of Autolycus of Pytane and Aristarchus of Samos), mathematics and related sciences (Euclid, Archimedes, Hypsicles of Alexandria, Theodosius of Bithynia, Hero of Alexandria, Diophantus), medicine (Rufus of Ephesus, Galen), and philosophy. Qusṭā translated the first book of Alexander of Aphrodisias' commentary on the *De generatione et corruptione*, lost in Greek, as well as part of his lost commentary on the *Physics*, and parts of Philoponus'. He also translated Aetius' *Placita*, a doxographical account on the physical doctrines of Greek antiquity. Qusṭā settled in Baghdad around 246/860. At that moment a circle of translators and scientists was already active, under the guidance of the man who has been described by later sources as "the philosopher of the Arabs": Abū Yūsuf b. Isḥāq al-Kindī (d. after 256/870), the initiator of *falsafa*. The existence of the "circle of al-Kindī" was discovered by Endress (Proclus Arabus). An in-depth analysis of the lexical features of a number of ancient Arabic translations of scientific and philosophical works led Endress to the conclusion that they had been produced by scholars sharing a common ground. The information provided by some of the texts translated and by the bio-bibliographers like Ibn al-Nadīm point to al-Kindī as the prominent figure of this milieu. He had al-Maʾmūn himself as the dedicatee of some of his works and was appointed preceptor to the son of al-Maʾmūn's successor al-Muʿtaṣim (r. 218-227/833-842). A key personality in the ʿAbbāsid court notwithstanding some reversal, al-Kindī had Aristotle's *Metaphysics* translated for him by the Patriarch of Alexandria Eustathius (Usṭāth), as recorded by Ibn al-Nadīm (*K. al-Fihrist*, 251.27 Flügel). Usṭāth translated also the *Geoponica* by Vindanius Anatolius (4th century) and Aristotle's *Nicomachean Ethics*: this translation has partly come down to us (Ullmann). Another scholar of Greek lineage whom we have already met in Salm's retinue, Yaḥyā b. al-Biṭrīq ("the son of the *patrikios*") authored the earliest translation of Aristotle's *De caelo*, which lies in the background of Kindī's cosmological works, as Usṭāth's Arabic version of the *Metaphysics* does with respect to Kindī's *First Philosophy*—a treatise which echoes Aristotle's masterpiece even in the title. Together with the *De caelo*, also an epitome of the *Meteorologica* and a selection of the *De partibus animalium* plus the *De generatione animalium* were translated by Yaḥyā b. al-Biṭrīq. The translations of the *Parva naturalia*, probably of the *De anima*, and surely of a Neoplatonic paraphrase of the same work show the deep interest of al-Kindī and his circle in Aristotle's all-embracing science. Another move was destined to have an even greater impact on the subsequent development of Arab philosophical thought: that of adding to Aristotle's cosmology and metaphysics a "theological" pinnacle derived from post-Aristotelian thought, especially though not exclusively Neoplatonic (Endress, The Circle of al-Kindī; Building the library). Within the circle of al-Kindī some writings by Alexander of Aphrodisias on issues like divine providence and the structure of the cosmos were translated. The Christian Ibn Nāʿima, from Emesa (al-Ḥimṣī), translated Plotinus' *Enneads* IV-VI. The

Arabic *Enneads*, heavily reworked, have come down to us under the pseudepigraphic label of *Theology of Aristotle*. It was al-Kindī himself, as we are told in the Prologue of the ps.-*Theology of Aristotle*, who "corrected" this work for Aḥmad, the son of al-Muʿtaṣim (ps.-*Theology of Aristotle*, ed. Badawī, 3.8-9). Another Neoplatonic text was attributed to Aristotle: a reworked selection of Proclus' *Elements of theology*. The model of every subsequent treatise of metaphysics *more geometrico demonstrata*, Proclus' *Elements of theology* follow Euclid's pattern and organise into theorems the theory of the procession of the many from the transcendent One. A number of these theorems has been found in Arabic translation, interspersed within a collection of genuine writings by Alexander of Aphrodisias, who allegedly extracted all these items "from Aristotle's Theology" (Endress, Proclus Arabus, 64-7). A rearrangement of a number of Proclus' theorems, attributed to Aristotle himself, is known in Arabic as the *Book of the exposition of pure good* (known as *Liber de Causis* in the Latin version: see below, section 5). The pseudo-*Theology* and the *Book of the pure good* credited "Aristotle" with the overarching model of a cosmic hierarchy in which the degrees of reality originate from the transcendent One, a view that features in most of the Arabic-Islamic philosophical systems from al-Fārābī to Ibn Sīnā and beyond. Parts of John Philoponus' huge polemical treatise *On the eternity of the world against Proclus* have been discovered, under Alexander of Aphrodisias' name, in an Arabic translation that bears the hallmarks of the circle of al-Kindī (Hasnawi). Also Proclus' *Eighteen arguments on the eternity of the cosmos*, which are extant in Greek only as a part of Philoponus' refutation mentioned above, feature in Arabic as an independent work, translated within this circle and re-translated later on. Another case of pseudepigraphy and reworking clearly connected with the "circle of al-Kindī" is that of Hippolytus of Rome, whose survey of Greek philosophical schools, heavily adapted, has been attributed to Ammonius, the head of the philosophical school of 6th century Alexandria. The importance of the activity of the circle of al-Kindī can hardly be exaggerated: for the first time Arab scholarship, going beyond the handbooks of logic and the "mirrors for princes", was faced with Greek discussions on crucial metaphysical topics like the nature of God, divine causality and the laws of nature, our possibility to grasp and express God's essence, the immortality of the soul, its provenance from a higher realm and its destiny in the afterlife, not to mention the philosophical ideal of wisdom as the key for happiness in this life. All these points were potentially conflicting with the Qurʾān and the worldview originated from it, if not in themselves, at least in the broader sense of a competing and equally all-embracing view on the issues of God and the cosmos, man and his destiny; however, the conviction emphatically uttered by al-Kindī in his *First Philosophy* was that Aristotle, the most eminent of the Greeks, taught on all these matters truths that go hand in hand with the Qurʾān—a typical tenet of Arabic-Islamic philosophy, which will be echoed three centuries later in the Muslim West by Ibn Rushd (Endress, The defence of reason). Simultaneously with the translations mentioned, one can notice the rise of philosophical and scientific treatises—a literary genre otherwise unknown in Arabic. Examples of this are not only and predictably writings like the Kindian *First philosophy* mentioned above, but also Qusṭa b. Lūqā's treatise on the *Difference between spirit and soul*, which echoes his translations of Galen, or again his works *On resolving problems in the third book of Euclid*, *On the translation of Diophantus' Algebra*, *On the calculation of the ascendant according to algebra*, and *On*

the use of the spherical astrolabe. A great deal of Arabic treatises in every branch of philosophy and the scientific disciplines will follow in the subsequent centuries. In the formative period under examination here, items of what has been labelled "The Eisagoge complex" (Peters, Aristotle and the Arabs, 79) are Kindī's *Epistle on definitions* (a sort of dictionary of philosophical terms) or his treatise *On the number of Aristotle's books*. Examples of this literary genre can be found also in geometry, astronomy, and medicine.

A contemporary of al-Kindī, the Christian Ḥunayn b. Isḥāq whom we have already met (see above, section 1) was the leading personality of another circle of translators, whose focus was on medicine, science, and philosophy. Ḥunayn was the pupil of Yūḥannā b. Māsawayh (d. 243/857), one of the members of the Syrian families of doctors that used to be appointed at the hospital of Baghdad since its foundation by Hārūn al-Rashīd (r. 170-193/786-809), and he himself a scholar who commissionated translations of medical works (Endress, Wissenschaftliche, 422-4 and 440-8). Ḥunayn's translations, both into Syriac (for his fellows, the Christian physicians) and Arabic (for his Muslim patrons), include some fifty treatises by Galen, among which the *Ars medica*, *On the sects for beginners*, *On the usefulness of parts of the body*, *The pulse for beginners*, *Therapeutics to Glaucon*, *On diseases and symptoms*, *On anatomy of veins and arteries*. Other treatises by Galen and a great amount of Greek medical literature have been translated by him and by other translators and scientists of what has been called (somehow incorrectly) the "school of Ḥunayn". Among them, we find Ḥunayn's son Isḥāq (d. 298/910), who translated Paul of Aegina's *Pragmateia* and many philosophical works (see below). Ḥunayn's nephew Ḥubaysh b. al-Ḥasan al-Aʿsam translated into Arabic the Syriac versions made by Ḥunayn of *On affected parts*, *The pulse for beginners* and *On the therapeutic method*. Iṣṭifān b. Bāsil translated from Greek the *Materia medica* by Dioscorides and the *Collectiones* by Oribasius. Abū ʿUthmān al-Dimashqī, who in 302/914 was appointed director of one of the Baghdad hospitals, translated Galen's *On the anatomy of the nerves*. A learned physician and scientist from Ḥarrān, Thābit b. Qurrā (see above) translated Ptolemy's *Almagest* and a great deal of mathematical works (Euclid, Archimedes, Apollonius of Perga, Hypsicles, Nicomachus of Gerasa); he also wrote extensively on Euclid, Ptolemy, and Aristotle. Ḥunayn, Isḥāq, and the scientists and translators that the ancient sources connect in various ways with them were interested also in philosophy. Some of their works are revisions of translations already extant, as is the case with the *Timaeus* (*K. al-Fihrist*, 246.15-16 Flügel); among Plato's works, Ḥunayn is credited also with the translation of the *Laws* (*K. al-Fihrist*, 246.5-6 Flügel). As for Aristotle, the logical works were translated (or re-translated), either by Ḥunayn, or by Isḥaq, or again by one or other scholar belonging to the same circle: this is for instance the case with the *De interpretatione*, translated by Tadhārī b. Bāsīl Akhī al-Iṣṭifān. In most cases, it is the translation of a member of this circle that has come down to us. At times the information given in the manuscripts does not match that of the bibliographical sources, as is the case with the *Categories*, whose translation is attributed to Ḥunayn in the *K. al-Fihrist* (248.20 Flügel), but to Isḥāq in the manuscript which forms the basis of the modern edition. Predictably, the witness of the manuscripts is sometimes erroneous: famous translators might have been credited with translations not authored by them, as is the case with Aristotle's *De anima*, which is attributed to Isḥāq b. Ḥunayn, but has convincingly been shown alien to his style and lexical habits (Gätje;

Arnzen, Aristoteles' De anima). There are also cases in which a partial translation was made by Ḥunayn, and Isḥaq brought it to completion: the *Posterior Analytics*, says Ibn al-Nadīm (*K. al-Fihrist*, 249.11-12 Flügel), was translated in this way into Syriac; later on, an Arabic version of this Syriac text was made, as we shall see in section 3. Still according to Ibn al-Nadīm (*K. al-Fihrist*, 249.15 Flügel), the *Topics* was translated into Syriac by Isḥāq, but the text that has come down to us and is edited is the Arabic version, made by Abū ʿUthmān al-Dimashqī, the doctor-in-chief that we have already met apropos Galen's *On the anatomy of the nerves*. The philosophical interests of Ḥunayn, Isḥaq and their associates extended beyond the *Organon*. Isḥāq translated the *Physics*, and this translation has come down to us, accompanied by a series of glosses and commentaries (about which more in section 3 below). Ḥunayn revised the Arabic version of the *De caelo* (*K. al-Fihrist*, 250.28-29 Flügel) which had been made within the circle of al-Kindī, and wrote a compendium of the *Meteorologica*. He is also credited with the Syriac translation of the *De generatione et corruptione*, while Isḥāq is credited with the Arabic version (*K. al-Fihrist*, 251.3 Flügel); both translations however are lost. Aristotle's *Metaphysics* is one of the most interesting stories to tell about the transmission of Greek philosophy and science to the Arabic-speaking world. As we have seen before, Ibn al-Nadīm says that it was translated for al-Kindī by Usṭāth; he also mentions a translation by Isḥāq (*K. al-Fihrist*, 251.26 Flügel). This account has been proved trustworthy when, in the first decennia of the 20th century, Father Maurice Bouyges S.J. unearthed and published in the Beirut series "Bibliotheca Arabica Scholasticorum" a manuscript, housed in Leiden, that contains the unique extant copy of Averroes' Great Commentary on the *Metaphysics* in Arabic (for the Latin version see below, section 5). Averroes' commentaries follow the text of the *Metaphysics* split into units (*lemmata*) as usual in the Greek commentary tradition which inspired him. Most of Aristotle's *lemmata* are given in Usṭāth's translation, but Isḥāq's one is present where Usṭāth's is missing, and there are also cases in which the main text bears Isḥāq's translation, and Usṭāth's one is copied in the margins. All this, together with details into which we cannot enter here, tells the story of an uninterrupted reflection on Aristotle's *Metaphysics*, from the ninth-century Baghdad to Averroes and beyond. Something similar happens in the case of the *Nicomachean Ethics*: books I-IV are extant in Isḥāq's translation, mentioned also in the *K. al-Fihrist* (252.2 Flügel), while for books V-X there is the translation by Usṭāth mentioned above (Ullmann). Isḥaq translated also Theophrastus' *Metaphysics*, and a number of post-Aristotelian philosophical works have been translated into Syriac and/or Arabic by scholars of this circle. Galen, as we have seen before, was lying at the core of Ḥunayn's interest; he did not limit himself to translating his medical books, but travelled far and wide in search of a complete copy of Galen's (lost) *De demonstratione* (*Epistle on Galen's books*, 47.15 Bergsträsser; see Endress, Wissenschaftliche, 425). Ḥunayn also translated into Syriac Galen's summary of the *Timaeus*; the Arabic version by one of his pupils has come down to us and has been edited (Kraus – Walzer). In fact, the exegesis of the basic texts by Plato, but chiefly by Aristotle seems to orientate the choice by Ḥunayn and his associates of the Greek post-classical works to be translated. Among them, there are some commentaries and personal works by Alexander of Aphrodisias: the *De anima* (lost in Arabic, but extant in the Hebrew version made from Arabic), the short but deeply influential *De intellectu* together with other parts of the so-called *Mantissa*, and a number of Questions which

raise and solve various controversial points following to the principle that Aristotle's philosophy is a systematic and totally consistent whole. Also Alexander's treatise *On the cosmos*, which had been translated into Syriac by Sergius of Resh'aynā more than three centuries before, was translated into Arabic within this circle. Abū 'Uthmān al-Dimashqī's name is often connected with translations of Alexander of Aphrodisias, and also with that of Porphyry's *Isagoge*. Isḥāq b. Ḥunayn translated Themistius' paraphrase of Aristotle's *De anima*: this Arabic version has come down to us and has been edited. While the Neoplatonic texts that are extant in Arabic have been translated mostly within the circle of al-Kindī, Ḥunayn and his associates did not completely discard this tradition of learning either. Some Proclus was translated: the final part of the commentary on the *Timaeus*, lost in Greek, and the *Eighteen arguments*, which had already been translated within the circle of al-Kindī (Wakelnig). The controversy about the eternity of the world versus the creation in time attracted much attention: the Arabic translation of two treatises by John Philoponus on this issue—one of them attested in Greek only through quotations and the other lost—belongs in all likelihood to this period. It looks as if every effort was made by Ḥunayn and his associates to create in the field of philosophy a canon of the basic readings and their authoritative exegeses, comparable to that which was well established in medicine. At variance with what happens with the translations that can be traced back to the circle of al-Kindī, there are no instances of pseudepigraphy in the output of this milieu, if not those which originated elsewhere. This is the case with the collection of Alexander of Aphrodisias' and Proclus' items mentioned above, whose translation is indeed attributed to Abū 'Uthmān al-Dimashqī, but which is not by him. Being interested in Alexander's works, al-Dimashqī was in all likelihood involved in one way or another in the transmission of this collection, something that may explain the mention of his name in some of the manuscripts conveying a bundle of texts that must be traced back to the circle of al-Kindī (Endress, Proclus Arabus, 64-7). In philosophy, the focus of Ḥunayn and his associates remains on Aristotle and the exegesis of his works: the undisputed authority granted to him inspired the label *al-mu'allim al-awwal* (the First Teacher) adopted by later authors like Ibn Sīnā (370/980-428/1037). On this point, Ḥunayn and his associates follow the lead of al-Kindī, who, following in his turn the late Neoplatonic pattern of the school of Alexandria, attributed to Aristotle the role of the peak of philosophical science. However, the translations of Ḥunayn and his circle pave the way to the rise of an awareness alien to al-Kindī: that of the possible dissensions among Greek philosophers, apparent from Alexander's defence of the truth and inner consistence of the Aristotelian corpus and even more from Philoponus' attacks against Aristotle's eternalism. On the one hand, the wide range of texts translated by Ḥunayn and his associates lies in the background of the rise of the Arab philosophical systems like Fārābī's or Ibn Sīnā's; on the other, it also elicited the suspicion that Greek philosophy, far from being that harmonic whole which might have appeared to al-Kindī when he depicted Aristotle as its herald and head, harboured conflicting views on issues as crucial as the eternity of the cosmos versus its creation in time. Both the variety of the sources translated and this awareness prepared the development of an exegetical school, the so-called "Aristotelians of Baghdad". Against this backdrop are better understood also the reflections of al-Fārābī on philosophy as a science, on its status and its relationship with the other

fields of learning as well as with religion. The early Būyid age provides the scenario for this development.

3. The debacle of the ʿAbbāsids was already complete when Aḥmad, one of the three brothers who established the Būyid rule (334-946/447-1055), occupied Baghdad in 334/946. Despite the disastrous socio-political conditions of the caliphate, the urban cultivated elites had developed into various and at times competing groups, both within the religious sciences and outiside them: traditionists, theologians, jurists, grammarians, belletrists, scientists of the different fields, and also the *falāsifa*. On the one hand, they shared with physicians, mathematicians, astronomers and architects the main area of the secular sciences; on the other, they dealt also with topics falling within the province of the religious disciplines (including *ʿilm al-lisān*, the normative grammar). The existence of at least one philosophical *majlis* (learned circle) especially focused on the Aristotelian corpus in tenth-century Baghdad is well attested, and during the early Būyid age *falsafa* was by now acknowledged as a proper field both by its practitioners and detractors, as we shall see in a while. In the first decades of the 4th/10th century, the Nestorian Christian Abū Bishr Mattā b. Yūnus (d. 329/940) came to Baghdad after having been trained in Aristotelian logic at the monastic school of Mār Mārī. He had no Greek, but his translations into Arabic from the Syriac versions of philosophical texts, coupled with his own exegetical works on Aristotle, raised him to the rank of a renowned master in Aristotelian studies. He is credited with translations of Aristotle (*Prior* and *Posterior Analytics*, *Soph. el.*, *Poetics*, *De gen. corr.*, *De sensu et sensato*, part of the *De caelo* and *Meteorologica*, Book XII of the *Metaphysics*), Alexander of Aphrodisias (*De providentia*, commentaries on *De gen. corr.*, *De caelo*, and Book XII of the *Metaphysics*), Themistius (paraphrases of *Posterior Analytics*, *De caelo* and Book XII of the *Metaphysics*), Olympiodorus (commentaries on the *De gen. corr*. and *Meteorologica*). Abū Bishr Mattā features as the champion of *falsafa* in a well-known dispute with the grammarian Abū Saʿīd al-Sīrāfī (d. 368/979) over the merits of logic versus grammar. If we trust al-Tawḥīdī's record of the dispute, Abū Bishr Mattā's plea for the universality of logical rules did not overcome the arguments of al-Sīrāfī; however, it was granted a survival and an amplification in the thought of his pupil al-Fārābī. The latter endorsed the idea of logic as the universal language of human reason independently of any cultural, linguistic and religious difference, an idea that provides the epistemological ground for Fārābī's distinctive theory of the philosopher-king, who gets from the separate Intellect of the Aristotelian-Neoplatonic tradition the rational principles for ruling the virtuous city. Hence, religion is seen by al-Fārābī as a way to convey truth to the vast majority of those who, being unable to access demonstrative reasoning, operate only with the soul's imaginative power, namely the recipient of the figurative language typical of the revealed Book. A Muslim, al-Fārābī was the pupil of Abū Bishr Mattā, who was a Nestorian Christian, and so was Yaḥyā b. ʿAdī (d. 364/974), a Jacobite Christian. This means that the Aristotelians of Baghdad followed the path of the inter-faith attitude laid down by the circles of Kindī's and Ḥunayn's times. The "school of Baghdad" has been described as an example of "philosophical humanism", whose "chief architects were the Christian philosopher Yaḥyā b. ʿAdī and his immediate disciples. […] Abū Ḥayyān al-Tawḥīdī's vivid portrayals of cultural life in Baghdad during this period reveal that, in the circles of Yaḥyā b. ʿAdī and of his pupil Abū Sulaymān al-Sijistānī,

and in the general intellectual ambiance of the time, Muslims, Christians, Jews, Ṣābians, and Mazdaeans communed in the study of the ancients—united by what Werner Jaeger once called 'the ecumenical power of antiquity'." (Kraemer, Humanism, 7). Some of the members of this circle prove to be keenly aware of a potential conflict between the proclaimed universality of logic-philosophical truths and the different, not to say conflicting views held by the Greek philosophers, whose multifarious options are by now well known. Aristotle criticised Plato in the *Metaphysics*, *De caelo*, *De anima*; he himself, the First Teacher, had been challenged by John Philoponus, who after all had also commented upon him; Alexander of Aphrodisias did not refrain from harshly criticising Galen, and argued in favour of Aristotle. That this was perceived as an intrinsic weakness by the detractors of *falsafa* is clearly stated by al-Fārābī in his *Harmonization of the two opinions of the two sages, Plato the divine and Aristotle*, a work whose Farabian authorship has been challenged, but whose testimony upon the intellectual climate in the philosophic circles of that age remains undeniable, whoever the author is. "I see most of the people of our time delving into and disputing whether the world is generated or eternal. They claim that there is disagreement between the two eminent and distinguished sages, Plato and Aristotle" (Harmonisation, trans. Butterworth, 125). The very title, *Kitāb al-jamʿ bayna raʾyay al-ḥakimayn, Aflāṭūn al-ilāhī wa-Arisṭūṭālīs*, echoes the *ijmāʿ* of the learned men, which counts as the criterion of truth for the Shāfiʿīte legal doctrine inspired by a well-known prophetic *ḥadīth* claiming that the *umma* of the believers would never have communed in error. Conversely, the lack of *ijmāʿ* proved by itself, in the eyes of the detractors of philosophy, that the proclaimed superiority of logic versus the revealed truth (and the language conveying it) was only a tale. The response from the camp of the *falāsifa* pivots on the claim of the harmony between Plato and Aristotle, typical of late Antiquity. The litigious and less brilliant successors to the two founders of philosophy may have engaged in disputes against the rival school, but if one focuses on the genuine doctrines of the founders, one will realise that on various topics "commentators from both camps have gone into excess (…) adducing proofs, repugnant things, and forced meanings" and have "twisted the statement of the leaders away from their intended customary usages", while those who "moderate their glance, aim at the truth, and abandon the way of prejudice" cannot but acknowledge their harmony (Harmonisation, trans. Butterworth, 143 and 145).

Ḥunayn and his associates, as we have seen before (section 2), were interested not only in philosophy, but also in the natural and mathematical sciences, chiefly in medicine; instead, the "Baghdad Aristotelians" narrowed the focus on philosophical literature. In their endeavour to make available as many exegetical works on Aristotle as possible, they reworked a great number of translations. We have already seen that Abū Bishr Mattā ibn Yūnus translated from Syriac into Arabic many works by Aristotle and on Aristotle, which had been translated from Greek into Syriac by Ḥunayn and his circle; of some of Abū Bishr Mattā's translations, the sources mention also a revision made by Yaḥyā b. ʿAdī. This is the case with Alexander of Aphrodisias' commentary on the *De caelo* (Ibn al-Nadīm, *K. al-Fihrist*, 264.1-2 Flügel) as well as with Themistius' paraphrasis of the same work (Endress, Works of Yaḥyā b. ʿAdī, 29-30). Yaḥyā b. ʿAdī is credited with translations into Arabic also of Plato's *Laws*, of Aristotle's *Topics* from Ḥunayn's Syriac version, of the *Soph. el*. from the Syriac version of Teophilus of Edessa, of the *Poetics*, possibly of the *Meteorologica*, and of Alexander of Aphrodisias'

commentaries on the *Categories* and the *Physics*, the latter being, more precisely, the correction of an earlier translation by a certain Abū Rawḥ al-Ṣābī. Yaḥyā b. ʿAdī was acquainted also with Simplicius' commentary on the *Categories*, whose Arabic translation is lost but is mentioned by Ibn al-Nadīm (*K. al-Fihrist*, 248.21 Flügel) and has left some traces in the scholarly work of this circle. In fact, the translations mentioned above were put in the service of the research carried on by the scholars who gathered to study Aristotle, as is made evident by two documents which have handed down to us the traces of the exegetical activity of this circle: one is the so-called "*Organon* of Baghdad", a manuscript housed in Paris and bearing an annotated "edition" of Aristotle's logical works (Hugonnard-Roche, Remarques) and the other is a manuscript of the Arabic version of Aristotle's *Physics*, housed in Leiden, which bears marginal annotations taken from the commentaries by Alexander of Aphrodisias and John Philoponus, from Themistius' paraphrasis, as well as from Abū Bishr Mattā's and Yaḥyā b. ʿAdī's own exegetical notes (Endress, Wissenschaftliche, 451). The personal library of this scholar must have been valuable, judging from his own works and from Ibn al-Nadīm's mention of the ancient books he says to have seen "in the copy of Yaḥyā b. ʿAdī" (Endress, Works of Yaḥyā b. ʿAdī, 6-7). That the documentary material available in this circle was quite impressive is shown by the *Ṣiwān al-ḥikma* (*Repository of wisdom*), a bio-bibliography of Greek and Arab philosophers from Thales to the authors of the 4th/10th century, in itself lost but attested by two works derived from it. The *Repository of wisdom* is attributed to Abū Sulaymān al-Sijistānī al-Manṭiqī (d. 371/981), the successor of Yaḥyā b. ʿAdī in the leadership of the circle and he himself the continuator of its logical tradition, as is shown by his *nisba*. As a matter of fact, the *Repository of wisdom* was not authored by him, but is connected in some way with his teaching activity. Abū Sulaymān al-Sijistānī was the teacher of Ibn al-Nadīm; the enormous amount of information on Greek philosophy and science stored in the *K. al-Fihrist* and the numerous doxographic compilations which both antedate and follow the *Repository of widsom* speak for themselves about knowledge of the Greek philosophical legacy in the 4th/10th century Baghdad. The works by al-Fārābī, even apart from the commentaries upon the so-called "enlarged *Organon*" of late Antiquity (Porphyry's *Isagoge* and Aristotle's *Categories*, *De interpretatione*, *Prior Analytics*, *Topics*, *Poetics*, *Rhetoric*), are rich in echoes of the Platonic, Aristotelian, Peripatetic and Neoplatonic traditions of thought. Also the somehow enigmatic encyclopaedia of the Brethren of Purity (2nd half of the 4th/10th century) heavily borrows from the translated texts, mostly Neoplatonic. The philosophical literature sprung from Baghdad reached also the provincial courts of Transoxania, as shown by the education received by Ibn Sīnā and by the libraries he visited. Both his philosophical summa, the *Kitāb al-shifāʾ* (*Book of the healing*) and his polemics against the "Baghdadians" are grounded on and reacting to the foundational texts and their interpretations, whose transmission to the Arabic-speaking world has been summarised above. Greek science underwent a similar process: the commentaries on the *Almagest* paved the way to the development of planetary theories (Saliba), and the attempts at systematising Galen's doctrines fuelled medical science (Ullmann, Medizin; Strohmaier, La ricezione), both in the form of structured treatises covering the entire field, and in that of monographs devoted to departmental disciplines like ophtalmology or surgery. The tradition of encyclopaedism inaugurated by al-Kindī and amplified in the circle of Ḥunayn was still alive: the renowned

physician Abū Bakr b. Zakariyyāʾ al-Rāzī (d. 313/925 or 320/932) dealt also with philosophy; conversely, Ibn Sīnā and Ibn Rushd (520/1126-595/1198) will provide examples of philosophers writing extensively also on medicine. However, the scientific fields were by now much more specialised than in Kindī's or Ḥunayn's times, and the specialists who authored personal works counting as summae of each discipline—as for instance the medical encyclopaedia *al-Ḥāwī fī l-Ṭibb* by al-Rāzī, or the astronomy *Tables* by al-Battānī (d. 317/929)—did not hesitate to challenge the established authorities. Instances of this are e.g. Rāzī's *Doubts about Galen* and the *Doubts about Ptolemy* by Ibn al-Haytham (354/965-432/1040 ca.). This process, which has been labelled "appropriation" (Sabra), had far-reaching implications. "The products of Greek science, in becoming more and more a part of Islamic culture, were disassociated from the Hellenistic worldview that was such a potent force in leading to the original appropriation. Thus this transformed Greek science became more utilitarian (or "instrumentalist") and less tied to a religiously suspect metaphysics" (Ragep, XVIII). The mathematician-astronomers attached to the mosque provide a good example for this. The rise of the *madrasa*, the institution of Muslim high education centred on law and the religious disciplines, and its proliferation in the second half of the 5th/11th century left little room for the teaching of sciences in and by themselves. Philosophy too underwent a process of appropriation, in so far as a certain amount of philosophical argumentations was embedded in speculative theology (*Kalām*). Within the *cursus studiorum* of the *madrasa*, philosophy in itself features only in the form of logical propaedeutics to the study of religious law, a move that has been described in terms of *Klerikalisierung der Wissenschaften und Verwissenschaftlichung der Religion*, especially apparent in Mongol and post-Mongol times (Endress, Dreifache Ancilla, 120). Theologians "regarded rational demonstration as a firm basis of sound argument in the service of Islam, and prepared the way for an Islamic scholasticism"; in the long run, their attempt at "building a theology made scientific paved the way to a philosophy made religious" (Endress, Cycle of knowledge, 127).

4. Also the West of the Muslim world had been reached by the wave of translations of Greek philosophical and scientific works of the early ʿAbbāsid age. In 317/929 the Umayyad ʿAbdarraḥmān III took to himself the title of caliph, and his son and successor al-Ḥakam II (r. 350-365/961-976) enhanced the fame of the library of Cordoba, which was credited with a patrimony of some 400.000 volumes before the dispersal that befell it as a consequence of the religious rigorist cleansings like that of Ibn Abī ʿĀmir al-Manṣūr (who ordered to publicly burn all the books on philosophy and astronomy) and as a consequence of the siege, fall and sack of the city by the Berber troops (403/1013). In the *Book of the information about the categories of the nations* by Ṣāʿid al-Andalusī, who was the qāḍī of Toledo shortly after the fall of Cordoba, we are told that al-Ḥakam II got books on the sciences of the Ancients to come from Baghdad and from Egypt, and that he had scholars and scientists from the East joining his court. This may count as another conduit for Greek learning in Arabic translation; in one case, we also know the name of the scholar and the work travelling with him: Abū l-Ḥakam al-Kirmānī brought to al-Andalus the *Epistles* of the Brethren of Purity (Endress, Wissenschaftliche, 455-6, referring to § 66-67 of Ṣāʿid's *K. al-Taʿrīf bi-ṭabaqāt al-umam*; Balty-Guesdon, Al-Andalus et l'héritage grec). Also the travels to the East by the learned men of al-Andalus may have

fuelled the scientific culture of the Muslim West, notwithstanding the hostile attitude towards the secular sciences both of the Mālikite school of law which dominated the region, and of Almoravid rule.

A complete inventory of the Arabic versions of Greek scientific and philosophic texts that reached al-Andalus has not yet been made, but the presence in the Iberian peninsula of one or other work may be inferred by their translations into Latin (see below, section 5) as well as from the commentaries, authored by Andalusian scholars, which obviously presuppose that the text commented upon was available in Arabic. This is the case with the Aristotelian corpus, which was known almost in its entirety, as proved by the commentaries devoted to Aristotle's *Physics*, *De caelo* and *De generatione et corruptione* by Ibn Bājja (d. 533/1139), and on a much greater scale by Ibn Rushd's various kinds of exegetical works (summaries, paraphrases, and lemmatic commentaries) on the *Categories*, *De interpretatione*, *Topics*, *Posterior Analytics*, *Rhetoric*, *Poetics*, *Physics*, *De caelo*, *De generatione et corruptione*, *Meteorologica*, *De sensu et sensato*, *De anima*, *Metaphysics*, and the *Nicomachean Ethics* plus some post-Aristotelian works, like Porphyry's *Isagoge*. Also the Greek commentaries forming the backbone of the exegetical activity in Baghdad reached al-Andalus, as is attested by their extensive use made by Ibn Rushd in his own exegeses of Aristotle: Ibn Rushd was especially conversant with the Arabic Alexander, but he was also acquainted with the Arabic Themistius. The multifarious legacy of the age of translations from Greek into Arabic was transmitted to Ibn Rushd also through Fārābī's and Ibn Sīnā's works: embedded in them, it was the typical intermingling of Aristotelianism and Neoplatonism of Arabic philosophy of the classical age that reached al-Andalus, and him. Also some of the creations of the circle of al-Kindī circulated in the libraries of the Muslim West: Ibn Bājja quotes as "Alexander's" genuine works some of the Proclean propositions of the *Elements of Theology* imbricated with Alexander's Questions (see above, section 2), and the pseudo-Aristotelian *Book of the exposition of pure good*, created out of Proclus' *Elements of theology* (see above, section 2) will be translated in Toledo in the second half of the 12th century (see below, section 5). As for the Greek scientific works translated into Arabic, in addition to the *Almagest* one can mention the Arabic version of Ptolemy's *Planisphere* as well as that of Euclid's *Elements* and *Data*, of Archimedes' *Measurement of the circle* and *On the sphere and cylinder*, of Autolycus' *On the moving sphere*, of Hypsicles' *Anaphoricus*, as well as of many medical works by Galen, and Dioscorides' *Materia medica*. Their presence in al-Andalus is ascertained in most cases from the Latin translations made from Arabic; but much more numerous are the scientific writings of the Arab authors who, in addition to assimilating Greek science, had written personal works in the various fields of medicine, astronomy, mathematics and optics, alchemy and magic: examples of this are the astrological work of Abū Maʿshar al-Balkhī (d. 272/886), and the arithmetics and astronomy tables by Muḥammad b. Mūsā al-Khwarīzmī (d. 235/850 ca), both well known in al-Andalus. As we have seen apropos Ibn al-Haythām (see above, section 3), the personal works of the Arab scientists, rooted as they are in the Greek foundational texts, at times give room to views conflicting with the doctrines held in them. This scientific literature paved the way to the critical assessment of some basic doctrines, as is the case with the challenge of Ptolemy's cosmology by the Sevillan al-Biṭrūjī (d. 600/1204 ca) and by Ibn Rushd, in what has been labelled the "Andalusian restoration

of Aristotle's cosmos" (Sabra, The Andalusian revolt; Endress, Mathematics and philosophy).

5. – A new movement of translations of philosophical and scientific literature, this time into Latin, started in the second half of the 11th century, in southern Italy. Some of these translations were from Greek, like that of Nemesius' *De natura hominis* by Alfanus, bishop of Salerno, but most of them were from Arabic: Constantine the African, who was based in the abbey of Montecassino, translated Hippocrates' *Aphorisms* together with Galen's commentaries, an introduction to medicine by Ḥunayn b. Isḥāq, and an adaptation of the medical companion by ʿAlī b. al-ʿAbbās al-Majūsī (*fl.* under the Būyid ʿAdūd al-Dawla), *al-Kunnāsh al-ʿAḍūdī*, also known as *al-Kitāb al-Malakī* (*Liber regius*). The *Kunnāsh* was re-translated shortly after by Stephen of Pisa, then based in Antioch. In the first half of the 12th century, a number of translations show the renewed interest of Latin scholarship in Greek learning, both in the field of logic (translations from Greek of the *Topics*, *Prior* and *Posterior Analytics*, which joined Boethius' translations from the end of Antiquity), and in the field of natural philosophy and metaphysics. James of Venice translated from Greek Aristotle's *De anima*, the *Parva naturalia* and the *Metaphysics*; Burgundio of Pisa translated the *De generatione et corruptione*, the *Nicomachean Ethics* and some Galen (the *Ars medica* and part of the commentaries to Hippocrates' *Aphorisms*). In Sicily, Henricus Aristippus (d. 1162) translated from Greek Plato's *Meno* and *Phaedo*, part of Aristotle's *Meteorologica*, Euclid's *Data*, *Optica* and *Catoptrica*, and Proclus' *Elements of Physics*. A manuscript of Ptolemy's *Mathematike Syntaxis*—the *Almagest*—was brought back by Henricus Aristippus from Constantinople, but the Latin translation was carried on by another anonymous scholar (d'Alverny, Translations and translators, 434).

At approximately the same time, the translations from Arabic into Latin flourished especially in Spain. They started in the first half of the 12th century, in the Christian north (Pedro Alfonsi, Plato of Tivoli, Hugo of Santalla), and flourished in the second half of the century, with Toledo as their main though not exclusive scenario. Toledo had been reconquered by the Christians in 1085, and the first bishop after the Muslim rule, the Cluny abbott Bernard of Agen (d. 1124), attracted many Jews running away from the Almohad rigorism (d'Alverny, Notes sur les traductions). His successors, Raymond and especially John of Castelmoron, who was bishop between 1152 and 1166, patronised translations often made with the intermediation of a learned Jew, as is the case with Gundissalinus' Latin version of the psychological section of Ibn Sīnā's *Kitāb al-shifāʾ*, the *Liber de anima seu sextus de naturalibus* which was offered to the bishop by the somewhat enigmatic "Avendauth israelita philosophus" (d'Alverny, Avendauth?). The planned translation of the *Kitāb al-shifāʾ* in its entirety ran into difficulties, but by the end of the century a first corpus of the *Avicenna latinus* was available (d'Alverny, L'introduction d'Avicenne en Occident). Gundisalvi translated also some works by al-Farābī and al-Ghāzālī's *Intentions of the philosophers*. Scholars like Adelard of Bath (d. 1151), Robert of Chester (fl. 1150 ca.), Daniel of Morley (d. 1210 ca.) and Gerard of Cremona (d. 1187), following unwittingly in the footsteps of Ḥunayn b. Isḥāq, headed out on long journeys in search of scientific books. Adelard translated from Arabic a compendium of Abū Maʿshar's *Introduction to Astrology* (*Ysagoga minor*), while the *Great introduction to astrology* was translated twice, by John of Seville in 1133 and by Hermann of Carinthia in 1140; Adelard translated also

a recension of Khwarīzmī's astronomy tables, and Euclid's *Elements*. For some of these scholars Spain was the place to settle, for a while or forever. This was the case with Gerard of Cremona, whose life and works are well known thanks to the list of his translations written down by his *socii* immediately after his death. A translator of scientific works (the most important being Ptolemy's *Almagest*, Hypsicles' *Anaphoricus*, Autolycus' *On the moving sphere*, Khwarīzmī's *Algebra*, Euclid's *Data*, Archimedes' *Measurement of the circle*, a number of treatises by Galen, Rāzī's compendium of medicine for al-Manṣūr, and Avicenna's *Canon of medicine*), as well as of works on occult sciences, Gerard translated from Arabic also Aristotle's *Posterior Analytics*, *Physics*, *De caelo*, *De gen. et corr.*, the epitome of the *Meteorologica* by Yaḥyā b. al-Biṭrīq and the pseudo-Aristotelian *Book of the exposition of pure good* (see above, section 2). He also translated some writings by Alexander of Aphrodisias and Themistius' paraphrasis of the *Posterior Analytics*, whose Arabic version is lost (see above, section 3). Among the works of the *falāsifa*, Gerard translated some writings by al-Kindī and al-Fārābī. After him, other translators (Alfred of Shareshill, Salio, Michael Scot, Hermann the German, William of Luna) increased the number of translations from Arabic. The focus is by now less on the Greek texts in their Arabic version than on the works of the Muslim scientists and philosophers. In some cases, the Muslim scholars whose works are translated are practically the contemporaries of their translators: Michael Scot (d. 1236) translated the treatise on celestial motions by al-Biṭrūjī and the commentaries by Ibn Rushd on the *De caelo*, *De generatione et corruptione*, *De anima*, and possibly on the *Metaphysics*, both authors being in fact only a generation older than him. Shortly after, in the 40's of the 13th century, Hermann the German translated Ibn Rushd's commentaries on the *Physics*, *Nicomachean Ethics*, *Poetics*, and *Rhetoric*; towards the middle of the 13th century, William of Luna translated his commentaries on Porphyry's *Isagoge* and Aristotle's *Categories* and *De interpretatione*. Most of these commentaries are quoted in those of the teachers in the universities of the Latin-speaking world, especially where the Faculty of Arts had developed as an institution of higher education focusing on logic and the philosophical sciences, as is the case in particular in 13th century Paris, but also elsewhere. In their endeavour to understand Aristotle and comment upon him, the masters of the Faculty of Arts made an immediate and intensive use of the Latin versions of Ibn Rushd's commentaries. So did also theologians like Thomas Aquinas. As Charles Burnett has it, "in the thirteenth century the barrier between Arabic and Latin was more porous than it had ever been [...] the translations of the commentaries of Averroes show a particularly clear example of 'internationalism'" (Burnett, Arabic into Latin, 381 and 382-3). The legacy of the Graeco-Arabic translations is obviously not confined to this and the works of the Muslim philosophers and scientists are obviously much more than conduits of Greek learning; but the assimilation in the Latin universities counts as a good example of the circulation of learning in the Medieval world.

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