# Michael Scot

LYNN THORNDIKE

Michael Scot, the leading intellectual in Europe during the early thirteenth century, has appeared both shadowy and intriguing to later generations. Alchemist, physician, astrologer and divine, his insistence on experience and his allusions to experiments influenced the methods later used by Grosseteste and Roger Bacon. But he also delighted in 'adulterine arts such as the interpretation of dreams, auguries and lots'.

Born in Scotland in about 1175, he is thought to have studied at Oxford, and very likely both taught and studied at the University of Paris. The earliest certain date in his cosmopolitan academic career is, however, 1217, when he translated the work of the twelfth-century astronomer Al-Bitrûgi at Toledo. In his later years he became astrologer to the Emperor Frederick II, at whose request many of his works were written.

As a translator Michael Scot is now seen to have been of the greatest importance, reforming the translations of Aristotlean metaphysics and natural philosophy, and acquainting the Latin world with recent Arab thought, including the commentaries of Averroes on Aristotle.

Professor Thorndike's description of Scot's life and his considerable achievements is detailed, lively and full of anecdote. His writings present a picture of society and

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# Contents

# List of Plates



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# Sigla

| | |
|---|---|
| *A* | Abraham Avenezra, Marginal glosses to astrological works of, by Michael Scot and others, from BN 7438 : TR 400 |
| *AL* | *Aristoteles Latinus:* I, Rome, 1939; II, Cambridge, 1955 |
| *BN* | Bibliothèque Nationale, Paris, Latin MS of- |
| *Brown* | J. Wood Brown, *An Enquiry into the Life and Legend of Michael Scot*, 1897 |
| *Du Cange* | *Glossarium mediae et infimae latinitatis.* Unveränderter Nachdruck der Ausgabe von 1883-1887 |
| *E* | Escorial f.III.8 |
| *GS* | George Sarton, *Introduction to the History of Science*, 3 vols. in 5, Washington, D.C., 1927-1948 |
| *H* | Charles H. Haskins, *Studies in the History of Medieval Science*, Cambridge, Mass., 1924; revised, 1927 |
| *M* | Munich, Staatsbibliothek, cod. lat. 10268 |
| *Ma* | Milan, Bibliotheca Ambrosiana, L.92. sup. |
| *O* | Oxford, Bodleian Library, Bodley 266 |
| *Oc* | Oxford, Bodleian Library, Canon. Misc. 555 |
| *P* | BN nouv. acq. 1401 |
| *S* | F. Saxl, *Verzeichnis astrol. u. mythol. Illustrierter Handschriften des lateinischen Mittelalters:* I (1915), Rome; II (1927), Vienna; III (1953), English Libraries, edited by Harry Bober |
| *T* | Lynn Thorndike, *The Sphere of Sacrobosco and its Commentators*, Chicago, 1949 |
| *TK* | Thorndike and Kibre, *A Catalogue of Incipits of Mediaeval Scientific Writings in Latin*, revised edition, Cambridge, Mass., 1963 |
| *TR* | Reproduction in the Collection of Lynn Thorndike |
| *V* | Vatican Library, Palatine Latin 1363, TR 392 |

# I · Introduction

Michael Scot may be regarded as the leading intellectual in western Europe during the first third of the thirteenth century. Pope Honorius III called him 'singularly gifted in science among men of learning.'[1] He introduced works of Avicenna and of Averroes to the Christian West. Roger Bacon credited him with the introduction of a new Aristotle. He brought about the revision, in 1228, of Leonardo of Pisa's important *Liber abaci*. His distinction between the seven regions of the air was not only incorporated by Thomas of Cantimpré in the sixteenth book of his encyclopedia *De natura rerum*, but was also so popular that in many manuscripts of that work it has become the opening passage. His *Divisio philosophica*, which owed something to a work by Gundislavus or Gundissalinus of the later twelfth century,[2] bearing a similar title, is extant in fragments quoted from it by that even more noted encyclopedist, Vincent of Beauvais, in the mid-thirteenth century, in his *Speculum doctrinale*, where he also made use of Michael Scot's *Liber introductorius*.

Scot's insistence upon experience and his allusions to experiments were further developed into experimental method by Robert Grosseteste and Roger Bacon. Before Roger he had distinguished between legitimate mathematics, as derived from *mathesis*, and forbidden divination, connected with *matesis*. John of Salisbury had made a somewhat similar suggestion in the twelfth century.[3] Scot anteceded Raymond Lull, who was perhaps born in the year of Michael's death, in the use of the

[1] Denifle et Chatelain, *Chartularium Universitatis Parisiensis*, I (1889), 104.
[2] He was a canon at Segovia as late as 1190, wrote with Avendauth to John, archbishop of Toledo from 1151 to 1166, rather than to Raymond, his predecessor (1125–51), and was not associated with John of Seville. See my article, 'John of Seville,' in *Speculum*, 34 (1959), 20–38, especially p. 21.
[3] See my *History of Magic and Experimental Science*, II, 158.

conception, chaos.[1] In the marginal glosses to a Latin manuscript of the astrological writings of Abraham Avenezra (*c.* 1090–1167), mostly in the translation by Peter of Abano (1250–1316?), quotations from Michael Scot vie with those from the late Roman astrologer, Julius Firmicus Maternus, and those from a later medieval astrologer, Leopold of Austria.[2] In the chapter on medicine we shall see Michael Scot anticipating Taddeo Alderotti in introducing into the Latin West the use of *consilium* in the sense of advice to a particular patient, or account of a particular case.

The common medieval title, *Secrets of Nature*, dates back at least to Michael's work on physiognomy. Extracts from the alchemical writings current under his name were added in the first printed edition (of 1546) of *The Precious New Pearl*. The metrical predictions of the fate of Italian cities ascribed to him were paralleled by an Italian Franciscan of the fourteenth century. He was quoted by Augustine of Trent as a 'great physician and astrologer . . . in his editions to Frederick the emperor.' He was cited more than once by the encyclopedist Bandini in the fourteenth century, when he was furthermore cited for astrological technique by John of Legano.[3] He was also used by Giovanni da Fontana and Michael Savonarola in the fifteenth century, while the theogony of Jacques Lefèvre d'Etaples reminds us of Michael's association of spirits with the celestial spheres.[4]

Among British scientists, Michael Scot fits in nicely between Alexander Neckam, who died in 1217, the earliest fixed date in Michael's career, and Robert Grosseteste, who outlived Scot by nearly twenty years to 1253, and whose translations, at least, were effected late in life. Contemporary with Michael appears to have been John of Sacrobosco or Holywood, the composition of whose *Sphere* I put early in the century.[5] John and Michael, as

[1] The Platonic conception of primeval chaos had been questioned by William of Conches and rejected by Daniel of Morley in the twelfth century: see Richard Lemay, *Abu Ma'shar and Latin Aristotelianism in the Twelfth Century*, Beirut, 1962, pp. 173, 325, etc. But Michael Scot revived it.

[2] The MS itself, Latin 7438 of the Bibliothèque Nationale, Paris, is of the fifteenth century.

[3] *A History of Magic and Experimental Science*, III, 73, 151, 223, 232, 563, 596.

[4] *Ibid.*, IV, 169, 179, 197, 515; at VI, 701, 'Michael Scot,' in the Index for the sixteenth century the last 167 applies to Vol. VI, not V.

[5] See the early pages of the Introduction to my *The Sphere of Sacrobosco and its Commentators*, 1949, where an earlier date for both the *Sphere* and *Computus* of

we shall see, may even have been together for a time at Paris. Another, perhaps older, English contemporary of Scot was Alfredus Anglicus or Alfred of Sareshel, who dedicated his translation of the pseudo-Aristotelian *De vegetabilibus* or *De plantis* to Roger of Hereford, added three chapters to the Latin version of the dubious fourth book of the *Meteorologica*,[1] and dedicated his own work on the motion of the heart (*De motu cordis*) to Alexander Neckam.

There can be little doubt that Michael Scot was first and foremost an intellectual. He held that every man ought to strive to be *sapiens* (a sage or intellectual) in this world.

> For a philosopher, if he dies in the Lord, will be placed in the order of Cherubim, which is translated 'Plenitude of science'; and a member of a religious order loving the Lord well, and a hermit, among the Seraphim; pope, emperor, cardinals and prelates will be located in the order of Thrones (M, 9rb; O, 11v–12v).

In another passage he says:

> One who wishes to have honour among the peoples of the world will gain it either by divine providence such as becoming bishop, abbot or patriarch by perfect election, or by perfect work, which is had by genius of nature or art, such as being an approved master of some faculty (M, 119vb).

But, he continues:

> It behoves one who desires to have in this world gain of much utility and honour, first to have grace from above, by which he may wisely regulate his genius and capacity of apprehending art.

Such passages further illustrate how religious as well as intellectual Michael was. In yet another place (Ma, 88vb) he mentions marvels of the world which God made, and continually makes, with great delight like a juggler.

Scot said that four things make a man wise: intelligence of reason, diligence in doing, experience of knowledge, and a living memory (M, 16va). He recognized, however, that some sages were easily deceived in practical matters and by such men as alchemists and necromancers. But he presumably flattered himself that he was immune from this susceptibility.

Sacrobosco than used to be held is argued, and the relation of the *Sphere* to the similar work by Grosseteste is discussed.

[1] We shall see in Chapter 3 that Michael Scot appears to have translated the commentary of Averroes upon it.

He also listed nine ways of truly learning (O, 222r–v): to want doctrine, to delight in doctrine, to stand on doctrine, to take doctrine, to establish doctrine, to add doctrine, to judge doctrine, to choose doctrine, and to proffer doctrine. With these he associated the names of the nine muses, and further defined the fifth way as memorizing that which one had got from a lecture or reading (*studio lectionis*); the sixth as finding anew for oneself what one had memorized; the seventh as judging what one finds 'by sight or hearing or both.'

Scot defined method as 'a compendious path, deviating from common obliquity,' which 'avoids the prolixities of superfluity,' and is therefore 'named doctrine and called science.' Science is 'the noble possession of the mind, or a state acquired by contemplation of intelligible virtue' (M, 15vb, margin).

In another passage he said:

> The more one scrutinizes the arcana of God and of the human heart, the more secret they will seem to him. There are three kinds or types of credibility. One is always believed and is understood by everybody, such as all histories, and the *res gestae* of the men who were before us. A second is first believed and afterwards understood, such as the sacrament of Christian faith, or redemption and resurrection, and the visible virtues of stones and herbs. The third is that which is understood the instant it is believed (O, 122vb).

In yet a third place Scot remarks that 'we in our time' have seen diverse books and many experiences (M, 114va).

> And because all science is from philosophy,[1] therefore we thus define it in this place. Philosophy is the doctrine of safety, choice of good, avoidance of evil, comprehension of virtue and omission of vices (Oc, 60ra).

Concerning *ars* or art, twelve things are asked: what is it? its matter, genus, parts, workers, office, aim, utility, end, instrument, why so called, and to what part of philosophy subordinated? (O, 21va; M, 16vb; P, 34vb–35ra; E, 57ra).

Aside from his translations, Michael Scot's chief extant work is *Liber introductorius*, which he described as follows at the close of its preface (O, 25va; P, 39).

> But before we proceed further with this discussion, planning to state many things about celestials and terrestrials which are secrets of the

[1] In some printed editions of *Liber physiognomiae* the abbreviation *Ph'ya* has been incorrectly rendered *Physonomia*.

philosophers and also pertain to the art of astronomy, we wish to open in an orderly manner this book on the entire art collected for beginners, which may deservedly be called *Introductorius.*

For this book consists of three books: the first of four distinctions;[1] the second is single, and we have called it *Particularis* because it treats of the judgments and questions of diverse persons;[2] the third book is called *Of physiognomy*, because it treats at length of natural judgments; and then is an epilogue,[3] just as before all the books there is a preface.

Of the aforesaid parts *Liber physiognomiae* was alone printed, appearing in no fewer than twenty editions before 1500.[4] This is not surprising, since its form was more finished, while its content was less miscellaneous and scattered than that of the first two parts, and better subordinated to a single subject.

Since the four chief manuscripts of the main part of Scot's *Liber introductorius*, as distinct from *Liber particularis* and *Liber physiognomiae*, differ in date, length, arrangement, and detail of content, it may be well to specify them here now, so that briefer reference may be made to them, as necessary. It is not unlikely that Michael himself left more than one draft of this unfinished work, much as Roger Bacon was to do in the case of his scientific writings.

P = Paris, Bibliothèque Nationale, nouv. acq. latin 1401, written about A.D. 1279, fols. 11–128. At fols. 129–62v follows an acephalous and incomplete *Liber particularis*, which is, however, unusually full upon some points. The MS was described by Leopold Delisle, *Catalogue des mss. du fond de la Trémoille*, 1889, pp. 41–3. I have used a photostat of fols. 11ra–41ra, 98v–128v, which Professor Haskins left to Harvard University, and a microfilm of the other leaves (TR 389), of which some are very distinct and others very indistinct.

E = Escorial (Spain), f. III. 8, 14th century, 126 double-columned fols. It is the most distinctly written and legible, although hitherto little used. I have a microfilm: TR 387.

M = Munich, Staatsbibliothek, cod. lat. 10268, 14th century,

[1] The fourth distinction does not seem to be reached in any of our manuscripts.
[2] Elsewhere *Particularis* is described as written particularly for Frederick II.
[3] The epilogue is not extant and perhaps was never written.
[4] Margaret B. Stillwell, *Incunabula in American Libraries*, 1940, M480–M488, lists nine in America.

146 double-columned fols. averaging sixty lines per column. I examined the MS in 1959, but have also used the complete photostat copy which Professor Haskins left to Harvard University.

O = Oxford, Bodleian Library, Bodley 266, 15th century, paper, 218 double-columned leaves, about the same length and roughly similar to M. Despite its late date, this MS evidently possesses independent value.

Some passages in the Paris manuscript, despite its earlier date, read more like brief summaries of the fuller text in the later Munich and Bodley manuscripts than they do like an expansion of it. So in some respects those longer texts may reflect Michael's original draft more faithfully.[1] Brief excerpts from Scot's work probably exist in many more manuscripts than have as yet been noted. In the Escorial manuscript the prologue is hardly half as long as in the other three, but much which they include in the prologue is found in its subsequent text.

For *Liber particularis*, aside from the incomplete text already noticed in the Paris manuscript, I have used my notes of long ago upon MS Canon. Misc. 555, 14th century, fols. 1–59, at the Bodleian, supplemented by Professor Haskins' photostat of the same.[2] Another photostat of my own (TR 390) covers the rest of the MS, including *Liber physonomie* at fols. 59rb–88vb.

It should be kept in mind that Scot's *Liber introductorius* was intended as a handbook for beginners in astrology and is a broad summary of existing knowledge, but in no sense a piece of advanced scientific research and thought, nor, except in so far as it aims at a *new* astrology, a critique of the present state of learning and a programme of reform thereof, such as the *Opus maius* of Roger Bacon. Its form as well as matter is affected by this. Many passages seem to be introduced to entertain and interest the new—and sometimes not overly intellectual (*pauperes intellectui*) (O, initial rubric)—students for whom Scot professes to be writing. At the same time our manuscripts bear witness to his own overflowing reservoir of subject-matter.

[1] These four manuscripts are discussed in greater detail in a contribution to the Festschrift issued in honour of Monsignore Albareda, prefect of the Vatican Library: *Didascalicae* (1961), pp. 427–47.

[2] See Appendix I for other MSS, either omitted or merely cited by Haskins, and including the *Physiognomy* as well as *Liber particularis*.

The *Prohemium*, although rather a lumbering composition, is a more finished text than the subsequent *Liber introductorius* and more unified, treating of God, the Trinity, angels, human nature, astronomy and astrology, and their history.

The text which follows is not only incomplete in all manuscripts, much shorter in two of them, and varying further in order and content, but is also characterized by frequent digression, abrupt transition, and repetition. Four different definitions of the word, horizon, appear within ten leaves of one manuscript. If, while Michael was discussing one topic, something else occurred to him, he would mention or even elaborate it, sometimes afterwards returning to the original topic, sometimes not. Thus, his treatment of the seven regions of air is interrupted by nearly three long columns of fifty-nine lines each on tastes (*sapores*) (M, 25va–26rb), before he resumes with the region of dew. Or, while discussing the twenty-eight mansions of the moon, he pauses to tell how the Emperor of Rome ('dear city') (*alme urbis*) would go upon the first day of the moon, 'with a great crowd of magnates to the synagogue of the gods,' and offer votive gifts and sacrifice, so that 'that day was celebrated as the Lord's day is by us today' (O, 121ra). Or he turns from the ages of the world to contrast the pardoning of the thief on the cross with the suicide of Judas (M, 88va).

All this confirms our conviction that the text, as we have it, is in an unfinished, unrevised, and somewhat chaotic state, the last being further accentuated by passages which were obviously interpolated after Scot's death, such as a citation of Campanus of Novara, an astronomer later in the century, a mention of Guido Bonatti, an astrologer later in the century, a quotation from Bartholomew of Parma in 1287, and a reference to the year A.D. 1320.

Yet our manuscripts are something more than a mere collection of materials from varying and divergent sources. They not only also reflect Michael's own observation and experience, but are written in a style of his own and reveal an underlying personality and individuality. He has a marked command of the Latin language and a wide vocabulary, even coining new words, as Carmody says of his translations.[1] Sometimes he is rhetorical,

[1] Al-Bitrûgi, *De motibus celorum*, critical edition of the Latin translation of Michael Scot, edited by Francis J. Carmody, 1952, p. 18.

but sometimes simple and direct, with homely illustrations and a fertile imaginative power of his own. He is not only full of the lore of the past, but of the life and language of the present.

Besides the three parts of *Liber introductorius*, there will be included here as possible works of Michael Scot the commentary on the *Sphere* of Sacrobosco, ascribed to him both in early printed editions and manuscripts,[1] the *Theorica planetarum*, current under the name of Gerard of Cremona, but in one manuscript attributed to Michael, and a geomancy, although it is available only in a manuscript of the sixteenth century.

Albertus Magnus wrote:

> Foul statements are found in that book which is called *Questions of Nicolaus the peripatetic*. I have been wont to say that Nicolaus did not make that book, but Michael Scot, who in truth did not know natures nor well understand the works of Aristotle.[2]

In 1915, according to Duhem, *Le système du monde*, III, 245, '*Ces Questions sont aujourd'hui perdues*,' except for a brief fragment to which Hauréau had called attention, in a manuscript then listed as Sorbonne 841 (now BN 16089, fol. 153v, *Sermo de questionibus quas accepimus a Nicolao, et nos dicemus in his secundum nostrum posse*) which fills less than a page in Duhem's French translation of it. In 1933, however, R. de Vaux wrote:[3]

> M. Birkenmajer a retrouvé cinq manuscrits de ces *Quaestiones* réputées perdues; il confirme l'attribution à Scot (*Du rôle des médecins et des naturalistes dans la réception d'Aristote aux XII^e et XIII^e siècles*, Varsovie, 1930, p. 10).

It would seem that the five manuscripts in question are those indexed in *Aristoteles Latinus*, of whose editorial board Birkenmajer became a member after Lacombe's death. But in only one of the five are the author and title given, while it and one other fail to report the *incipit*, which in three is given as, 'Quoniam

[1] For a recent critical edition see my *The Sphere of Sacrobosco and its Commentators*, Chicago 1949, pp. 247–342, henceforth cited as T. G. Libri, *Histoire des sciences mathématiques in Italie*, Paris 1838, II, 23, was very favourably impressed by Michael's commentary on the *Sphere*, from which he briefly noted several passages, saying, '*Ils semblent prouver que Michael Scot avait des connoissances fort avancées pour son siècle*.' They were, however, not so unusual then as Libri thought.

[2] H, 279, n. 45, from *Opera*, ed. Borgnet, Paris, IV (1890). Haskins goes on to say, 'Birkenmajer is preparing an edition of these *Questiones*.' Yet in the very next footnote the page of Duhem to which I am about to refer is cited.

[3] *Revue des sciences philos. et theol.*, 22, 220, n. 4.

terra sperica . . .' In 1939 James Corbett, in his *Catalogue des manuscrits alchimiques latins* for Paris, gave this as the incipit of *Questiones Nicolai Peripathetici* in BN 7156, 13–14th century, fols. 42v–48v, adding:

> L'attribution à Nicolaus Peripatheticus est confirmée par M. Birkenmajer, qui prépare une édition de cet ouvrage.

Since Birkenmajer has not yet to my knowledge published his edition of the *Questiones*, I reproduce in an appendix, in a free English translation and paraphrase, much of the text from this BN 7156, which is in the form of alchemical and other natural *dicta* rather than questions.[1]

Some works have been mistakenly ascribed to Michael Scot in catalogues of manuscript collections. At the Bodleian the MS Canon, Misc. 378, 15th century, is not, as has been thought, a cosmography by Michael in three parts, but three independent and much earlier works: the first by Julius Honorius (the pseudo-Ethicus), then Dicuil, *De mensura orbis terrae*, and finally *De rebus bellicis* from the *Codex Spirensis* of the tenth century.[2] In this case the cataloguer of the Canonicus manuscripts was misled by a statement at fol. 170 by one Petrus Donatus:

> Exemplata est hec cosmographia que Scoti dicitur cum picturis ex vetustissimo codice quem habui ex Spirensi bibliotheca anno Domini M.CCCC.xxvi mense ianuario.

The old catalogue of the library of the Dukes of Burgundy at Brussels represented item 11963, 13th century, fols. 92vb–98rb, as 'Prophecies of Michael Scot,' but it is rather an extract from a Joachimite interpretation of Jeremiah.[3]

The following brief text is less patently spurious. In the catalogue of his library, written in his own hand about 1412, Amplonius Ratinck, among *'libri quos ego Amplonius habeo in sacra theologia,'* listed a *Liber translative theologie de decem kathegoriis per Michaelem Schotum*, which still exists in the same manuscript at the Stadt- und Hochschul-bibliothek of Erfurt, Amplon. F. 179, 14th century, fols. 98rb–99rb, opening, *'Omnes nostre voces . . .'* and closing, *'. . . fatigacionem ac mortem pertulit.*

[1] For yet another MS, TK 1305.
[2] Another similar reproduction of the lost *Spirensis* is at Munich, cod. lat. 10291.
[3] Hubert Silvestre, in *Scriptorium*, IV (1950), 156, citing O. Holder-Egger, *Neues Archiv d. G. f. ä. d. Gk.*, XV (1890), 152.

*Expl. trans. theol. d. X cath.*'[1] The text inquires how far and in what sense the ten categories apply in Christian theology.

Another work with which the name of Michael Scot has sometimes been associated, but which is certainly not by him, is *Mensa philosophica* or *The Philosopher's Banquet*, as it is entitled in an English translation published in 1614. It seems to have first appeared in printed form, of which there are a number of editions, both before and after 1500.

Inasmuch as the present volume is so largely based upon unpublished manuscripts, which further differ considerably from one another, it has seemed advisable to cite them and a few standard printed works throughout the text by brief sigla (see the page facing p.1).

[1] I received a microfilm as a gift from the Erfurt Library in August 1961: TR 399.

# II · Youth and Education: Student and Teacher

In 1224, eleven years or so before his death, Michael Scot was described by the Pope as 'burning from boyhood with love of science.' We shall presently note a number of passages from Michael's own writings in support of this statement.

Just when or where in Scotland Michael was born is unknown,[1] as are details of his schooling. But his education had evidently been broad, and the fact that he is usually called 'Master Michael Scot' indicates that he had taken the master's degree in some university, and very likely had taught subsequently.

Dante's brief allusion to Michael's 'thin shanks' seems to be

[1] John Ferguson, the noted bibliographer, opened a lecture of 1886 on Michael Scot by saying:

> During the summer of 1868, I visited Balwearie Castle, between Kirkcaldy and Auchentool, in Abbotshall Parish, Fifeshire, Aikwood or Oakwood or Oakwood Tower, on the south bank of the Ettrick Water, about three miles from Selkirk and Melrose Abbey. These three places are traditionally connected with Michael Scot—Balwearie is said to have been his birthplace, Aikwood Tower his residence, or one of his residences, Melrose Abbey his final resting place.

He went on to say:

> I have not been able to ascertain the origin of the tradition which makes Balwearie to have been his birthplace, and ultimately his own property and residence. So far as I know, the tradition is modern, and it is possible that it has arisen from the fact that there were Scotts of Balwearie. But for the persistence of tradition, I should agree with Bruce (*Eminent Men of Fife*, 1846) in thinking his connection with Balwearie questionable.

The lecture was revised in 1908–9, but left in manuscript form at Ferguson's death, when it was published as 'A short biography and bibliography of Michael Scotus,' in *Records of the Glasgow Bibliographical Society*, IX (1931), 75–100, with an introduction by Elizabeth A. Alexander, at pp. 73–4.

Sante Ferrari, *Memorie della R. Accad. dei Lincei, Classe di scienze morali, storiche e filologiche*, V (1918), 719, citing Clerval, *Les écoles de Chartres*, 1895, 350–1, identified Michael Scot with a '*magistrum Michaelem Cornutensem clericum nostrum dictum Scotum*,' who in 1252–3, and hence long after Michael Scot's death, was chancellor of John and Matilda of Chartres. Ferrari translated *Cornutensem as* 'of Cornwall' (*di Cornovaglia*), but I presume that it is a slip for *Carnutensem* (of Chartres).

the sole extant description of his physical appearance. In the statue, of dubious origin, on his tomb in Melrose Abbey, these lower members are overshadowed by a large bearded and turbaned head.

Nor do we know when Michael left Scotland or the British Isles. But his known career was to be continental and cosmopolitan rather than insular or national. Saxl (S, III, xxxv) seems amply justified in speaking of him as *'dieser internationalgebildete Mann.'* In only one or two passages have I found him listing Scotland (but not England) together with other places (M, 70vb; P, 153r). Adelard of Bath, early in the twelfth century, and Daniel of Morley, towards its close, had likewise left the British Isles for the continent of Europe in search of Arabic learning. But both tell us of their return to England. Michael Scot, so far as we know, did not come back, at least not alive.

Although the earliest fixed date in Michael's career is that of 1217 for one of his translations in Toledo, the unpublished manuscripts of his works contain allusions to student life, which sound like personal reminiscences but have not hitherto been noted.

First may be adduced a passage on stringed instruments, such as the viola, psaltery, lute, *ineba*,[1] and harp, of which the lyre or *senphonium* 'pertains to poor scholars, because, if they play it well, it pays their way everywhere in Christendom.' Michael continues:

> The cause is God and the virtue of the sound of chords, and of songs of devotion to God and His Mother, or to St. Nicholas, which [or, who] in life and death greatly aids scholars (scholaribus, puellis et *mafinariis*).
> Nor is there a musical instrument that can better guide his life everywhere, whoever plays it, than the lyre, as is clear from the experience of anyone who goes from door to door playing it.[2]

Another passage (M, 128ra) which, one suspects, may be connected with Scot's own student days, is the first example that

[1] The words which are here italicized are not found in existing medieval dictionaries and seem peculiar to Scot. We shall find the same true in many other cases.

[2] Since the passage is found only in the margin of M, 48rb, and not at the corresponding place in O, it may seem a later interpolation. But, as I have repeatedly shown elsewhere, it is just such personal and contemporary passages, full of local colour and individual detail, that are apt to be omitted in later manuscripts and early printed editions.

he gives of a method of answering astrological interrogations by sending the inquirer out to the public way to bring back any object which he sees there, on the theory that he will be guided in his choice by the influence of the stars at that moment.

There was a fatherless boy, whose uncle cared for him as if he had been his own son, and, from the love that he had for him, sent him to a university abroad (there were no universities in Scotland until the fifteenth century). He gave him a small amount of money for expenses, saying:

> My son, I know that this money is not enough for you for three months, but go ahead, because, before two months are over, I will come to you, or I will send my own messenger to you with a lot of money.

So he went. But after three months neither uncle nor more money had appeared, and he feared that his uncle had died or was ill, or had become alienated from his nephew through listening to lies about the latter.

> He has asked you [the astrologer] what he should do and what he ought to believe. Note first the hour and fraction of the hour, and to which of the planets the present hour is to be attributed. Then tell him to go into the street and pick up something and bring it to you.

The boy comes back with a bit of glass which is partly covered with mud. The astrologer thereupon affirms that his uncle loves him as much as ever, and has been prevented *ab alienis* from coming himself or sending money as he had promised, but that he will do so shortly.

> The clarity of the glass signifies love; its solidity, constancy; the mud on it, the impediment. But since that glass was part of a broken vase, it signifies that the affair will be quickly expedited, as the glass can be quickly cleaned from mud, and so he will come to him or will order [the money to be sent].

This may seem a very far-fetched method of divination to be employed and recommended by a scientist, but serves to remind us that astrology was the supreme science in the thirteenth century, and that the fundamental natural law almost to the time of Newton was the subjection of the inferior elementary bodies

to the rule of the stars.[1] Perhaps the success of this method in Michael's particular case served further to recommend it to him. One also wonders if he has himself in mind in alluding to the son of a poor woman who is perhaps born in a hovel and remains in poverty throughout his boyhood, but afterwards begins gradually to prosper until he becomes rich in science or attains some dignity of honour (P, 12ra).

The very next example of the aforesaid method of answering interrogations is that of a bishop elect in a disputed election, who brought in a quill pen from the right wing of a goose, which was of two colours, white and grey (*Pars autem nervi scribendi erat alba et altera pars grixia*). The tip was curved and the feathers of the white were slightly separated, and, as held by the inquirer, *'id* [sic] *partem nervi est albi coloris.'* The judgment is that the inquirer has a better chance of election than the adverse party, and, if ever there is agreement made between them, the initiative will come from the adverse party; and if it is fought out, the inquirer will win. It is tempting to regard the inquirer in this case also as Michael Scot, although perhaps not in his election in 1224 as archbishop of Cashel in Ireland, of which we shall speak further in Chapter IV.

From two other passages in *Liber introductorius* one is inclined to infer that Michael regarded himself as born under the planet Mercury. The following passage, here freely translated, is roughly the same in three of our manuscripts (E, 93va; M, 103va; O, 157).

> A mercurial person naturally delights in an easy, honourable and peaceful occupation, albeit unprofitable at certain times of the year. He is serious and a great reader, notes important questions, and wants to know all the answers. He is interested in miniatures, painting, sculpture, school-teaching and wants to be able to instruct scholars or disciples in white magic, to engage in business, and to perform tricks and subtleties which give pleasure to others.
>
> He is anxious to save his soul, and, as he grows older, is very conscientious. Sometimes he may sin like others, but he is extremely anxious to live morally.
>
> He delights particularly in astronomy, natural science, law and divinity, and in adulterine arts such as interpretation of dreams, auguries and lots.
>
> Very pleasing to him also are *ars* and *ypothecaria*, the exchange,

[1] See my 'The Place of Astrology in the History of Science,' *Isis*, 46 (1955), 273–8.

and the company of wise men, that is, lettered and ingenious men; but he prefers to eat and drink privately. He cares not for public dinners, and seldom eats in others' houses.

The other passage, from the early Paris manuscript (P, 86v), is even more personal.

> Mercury, from the day of his birth all through life, is of dark colour, laborious, ingenious, fluent, eloquent, thoughtful, a good penman, a good miniaturist, a good painter, a good engraver, a very steady worker and hard student, poor rather than rich in temporal goods, yet rich in character and in many sciences. Fortune is cruel to him as to his friends, except for their love, since he is beloved by them, but gets no service or practically none from them, while he wastes much of his service on strangers, for his goodness or science or genius is rarely of any value to himself.
>
> He is stout rather than thin—which does not agree with Dante's mention of Michael's 'thin shanks'; pacific, discreet, moderate in all things and impartial with everyone, more generous and fortunate with strangers than with his own neighbours in receiving service and in knowing love.

Not only are there passages in Scot's writings which seem reminiscent of his own student days, but there are also other features which suggest that he may have taught grammar, that is, the Latin language and literature, before going to Toledo as a translator or making astrology his speciality. In the preface to *Liber particularis* he looks back upon *Liber introductorius* as written at the request of Frederick II 'in a popular grammar school style' (*iuxta vulgarem in gramatica compillavi*), suited to newcomers and beginners, who are at times further described as of gross (i.e. not subtle) intelligence (H, 291). In it points are made perfectly clear and rammed mercilessly home. For example, having stated that the zodiac is divided into 360 degrees, and that thirty-six days of the solar year make a tenth part of it, he adds that the heaven as a whole makes barely one revolution in 36,000 years, so that it takes 3,000 years to move the length of a single sign of the zodiac, 9,000 years to cover one-quarter of the celestial circle or one triplicity of the signs, and 18,000 years to complete one-half of that circle (E, 1vb). In mentioning a word, Michael often gives the genitive singular as well as the nominative case for a noun, or, if it be a verb, the ending of the second person singular as well as the first person

singular. Sometimes the Greek equivalent is given: the extreme vertices upon which the celestial sphere revolves, they call poles. Or Hebrew is added; angel in Greek is *malath* in Hebrew, *nuntius* or *cursor* in Latin (M, 9va).

> De notitia obviationis. Obuio-as verbum neutrum est et exempli gratia dictum transitive ut ob- (Oc, 77vb) uio tibi et tu obuias mihi. Et ab hoc verbo obuio-as derivatur hec obuiatio, huius obuiationis. (See Ma, 118r.)

In general Michael shows great interest in names, definitions, and etymologies. He asks if angels have individual names as men do, treats of the virtues of the names of angels, and later lists those for the seven planets and twelve signs, winds and parts of the world, the four horses of the sun, and days and months. The name for heaven in Greek is *planos*; in Latin, *celum*. A number of Arabic names are explained at greater length. It is asked why the first man called himself Adam, and his wife, Eve. Names of nautical craft are listed in connection with an astrological interrogation on when to begin to build *navem aut galleam vel caretam vel banconem vel cochem* (M, 136va). In connection with the astrolabe, the names of its parts are explained (M, 120vb). Although the four elements had already been treated in *Liber introductorius*, in *Liber particularis* under fire were defined *flamma*, *carbo*, *pruna*, and *favilla* (Oc, 37va); relating to air, *calligo*, rainbow, dew, rain (*pluvia*), drop (*gutta*), snow, wind, lightning, thunder, pestilence (Oc, 37vb); under earth, *humidus*, *tellus*, *mons*, *tumulus*, *ager*, *rus*, *pratum*, *pascua*, *gleba*, *desertum*, *nemus*, *spelunca*, *fovea*, *fossatum*, *fondus*, *barartum*, *stix*, *Tartarus*, and *Inferno* (Oc, 39va–40ra). Michael enjoyed distinguishing differences in meaning between such words as *stella*, *astrum*, *sidus*, *signum*, *imago*, and *planeta* (M, 31va–b; O, 42ra–b; P, 48v–49r).

Different definitions of the same word are found either together or separately. When stating that the rainbow has two names, he adds that the sun has seven. *Annus* or year comes from *a* privative or without, and *nus*, which is *non* or *nullus*; or from *ana*, which is 'so much' (*tantum*), because one year is as long as another—'I speak partitively. It is also called from *annuo -is*, to give, since the operation of nature unceasingly *nobis annuit*, *id est*, *dat*. Or it is called *a* from innovating' (P, 55r).

This method of exegesis went back to the *Etymologies* of Isidore of Seville in the seventh century, perhaps much further. It was still in high favour with Michael's contemporaries, and his use of it indicates that he had been both a student and teacher of Latin grammar and literature.

Michael's etymologies are sometimes from Isidore, sometimes perhaps of his own devising. He follows Isidore in saying that night (*nox*) is derived from the verb to harm (*noceo*), because it hurts the eyes, but adds that this is because they cannot see without some other light, such as that of the moon, fire, carbuncle, glow-worm, or wood decaying in water. Scot adds further that it is not harmful to all, since thieves and robbers, beasts of prey and nocturnal birds benefit from darkness (M, 52rb). The word for sea, *mare*, he derives from *amara*, meaning bitter (Oc, 38vb). Water from the sea runs in hidden veins underground, where it loses its bitterness and emerges in sweet springs, which return again to the sea—a generally held belief since Aristotle.

This *penchant* for etymology was by no means peculiar to Michael Scot. Of his contemporary, Robert Grosseteste, S. Harrison Thomson writes: 'He never consciously avoids an opportunity to discuss etymology, if it can be brought in.'[1]

Another probable relic of early elementary teaching is Scot's use of homely illustrations, which further shed light on the life of his times and his own personality. Thus, in his treatise on physiognomy, Michael compares the giving of a new and free soul to the human body by God with a father's giving a new, polished slate or immaculate notebook to his son,

> that he may learn with it, write on it the teaching of one master or many. Thus the said boy has the power of making of it whatever he will for good or ill (cap. 9; Oc, 64va).

Scot compared the axis of the heavens to a thread hanging in air from a spider web, and to the axle-bar of a mill wheel or the axle-tree of the wheels of a wagon,[2] and the planets not to nails in a wall but to ants moving on the rim of a wheel (O, 42ra;

[1] Professor Thomson admits having written this, but, like myself, cannot recall just where.

[2] '*tamquam fusus in medio rote molini vel tamquam sala rotarum plaustri*,' M, 48rb; O, 57vb–58ra.

M, 31va). Elsewhere he called the heavens the sun's house, moon's chamber, and spacious park of the planets,

> since each one of them has in it halls and courses of varied significance (O, 41rb).

The sky was also likened to a sealed vase, because it was adorned with many and varied mysteries and stars. Elsewhere homelier comparisons of the universe were made, to an apple, whole and round, but containing hidden seeds of future development, or to an artificer, who has the house which he is to construct already fully worked out in his mind (O, 120rb). Again Michael compared this world to a market-place or garden. The stars are only signs and not causes of the future, just as the circle hanging before a tavern is not wine but the sign of wine (M, 1r; P, 11v). God created the universe all together, yet in separate parts, just as many loaves of bread are baked from a single mass of dough, and lost souls in the Inferno are likened to loaves of bread in an oven.[1]

Sometimes Michael, for the sake of greater vividness no doubt, put his illustration in the first person.

> If I buy mountain sheep and put them out to pasture in a damp valley, which may be beautiful and fertile, they nevertheless quickly grow worse on me and suddenly die. And vice versa.
>
> The same is true of a horse. If I buy an emaciated horse, used in pastures of damp soil and swampy herbs, and take it to graze in pasture of rocky mountain clad with good herbs, it soon regains its health.[2]

Besides such homely illustrations, anecdotes and stories might be told to capture or hold the student's interest. In *Liber particularis* (Oc, 52va) we find the tale of an ape or monkey with three young. When pursued, she takes the one she loves best by the hand, the second under her arm, and leaves the third which she likes least to its fate. But it leaps on to its mother's back and alone escapes when she loses hold of the others. In

[1] For oven, in addition to *clibanus* (κλίβανος), Scot used *epicastorium*—'*ut crescit pasta fermentata in epicastorio de qua exeunt multi panes et parvi et magni*' (M, 88vb). Du Cange, *Glossarium*, first defines *epicaustorium* as a solarium, and does not note Michael Scot, citing John (Balbi) of Genoa, who died in 1298, first for its definition as '*Instrumentum quod fit super ignem. . . .*'

[2] O, 40va. Not in M

another manuscript (P, 160v) the story is told of only two young. Yet other versions occur in Bestiaries.

Other stories are found in *Liber introductorius*. Scot had warned the Emperor not to be bled when the moon was in the sign Gemini (the Twins), lest a double puncture occur. Curious to test this, Frederick called in his barber at such a time, and was assured that all circumstances were favourable for a phlebotomy.

> To whom the Emperor said: Master, I am afraid you may prick me twice, which, when it happens, is dangerous. Then the barber said: Lord, I am willing to lose my head if I prick you more than once.

But after performing the phlebotomy successfully, he accidentally dropped the lancet on Frederick's foot, producing a tumour which required surgical attention for a fortnight (H, 289).

Another anecdote involving Frederick II tells how when hunting he made Scot measure the distance to the sphere of the fixed stars from or by the tower of a church which they passed. He then secretly had the top of the tower shortened by half a foot and on another hunting expedition asked Michael to repeat his observation and measurement. When Scot reached a different result, he told the Emperor that either the sky must have risen or the tower sunk into the ground one palm or a half-foot, whereupon the Emperor embraced him in astonishment. This story is inconsistent with several passages in which Scot holds that the distance from earth to the heavens is unknown. However, in the Chronicle of Salimbene (1221–88), a similar story is told, substituting the floor of the imperial palace for the church tower.

As attributed to Michael Scot, the story is found only in the Munich manuscript and disagrees with another told later in the same manuscript from a *fabula poetica*, which is there summarized in prose. In this second story the King of Persia wanted to know where the centre of the earth was. A villein volunteered to answer his question. On the appointed day he came with a crowd of followers, who were secretly armed, took the King's sceptre and stood its head on the ground, saying:

> Lord, here is the middle of the world. If you will not believe it or are dissatisfied with me, since you are a great prince on earth, let

mountains and valleys be destroyed and cause bridges to be made, and I am ready to measure this, and if it shall have appeared to you that I have erred, do with me as you will.

The King, thinking that this could not be done, admitted that this was a good answer, but added:

Since you have not given me greater certitude, I want to know how many stars there are in the sky.

To which the villein replied:

Things possible should be sought. But if you will first explain the mountains and alps, and land is left to me, I will well number all the stars and tell you how many there are.

The King was not satisfied.

You have conquered me in this. But tell me how many miles there are from the lowest point of earth to the highest part of the heavens, and afterwards we will give you your reward.

Thereupon the villein lost patience and, making a sign to the associates who had come with him, said:

You want to know the impossible and you see that you are not fit to reign; you have reigned long enough; rest now from labour, turn over your kingdom to me.

With this he dragged him to the ground by the ears and slew him. Whereupon his associates cried, '*Vivat! vivat!* lord and master of Solomon,' and killed all the others (M, 122vb–123va).

The difficulties of the student and teacher are well set forth by Michael in a chapter, '*De forma planetarum*' (E, 85va; M, 100ra).

Since it is hard to join many things together, and to keep them together once they are united, therefore as to the form of the planets and their nature and properties in particular as well as in general, for the benefit of the scholar who is a novice in this art and of faulty memory, we have taken pains to collect all these in one according to the ability given us and experience of particular cases.

But since the aforesaid sometimes ought to be investigated straightaway, and are scattered in the books of this volume through many chapters, there would be too much labour and time of much

predicting, or error would intervene. Therefore we have made a distinction for each planet, reciting by a series of chapters *sub compendio*, and finally a table sufficiently demonstrating single points. And by it is a sweeter elucidation, nor is there too much digression afterwards concerning each.

Such tables occur frequently in *Liber introductorius*.

# III · Michael Scot as a Translator

The first fixed date in the life of Michael Scot was 18 August 1217, at Toledo in the heart of Spain, where he completed a Latin translation of the late-twelfth-century astronomical work of Alpetragius (Al-Bitrogi or Al-Bitrûgi), entitled in Arabic *Kitab al-hai'a*. Al-Bitrûgi lived in the Spanish peninsula and was still living when Scot made his translation.[1]

For a century past western Christian students and translators had been coming to Spain and especially to Toledo. One of the first, Adelard of Bath, had been from Great Britain. His interests and translating had been varied, including astronomy and astrology.[2] But in the second quarter of the twelfth century Arabic astrology had been the prime objective of translators into Latin such as John of Seville and Hermann of Carinthia. Then the tremendous energy of Gerard of Cremona, who died in 1187, had extended itself to the fields of medicine and the natural philosophy of Aristotle as well, and in 1175 he had executed what was to be the standard medieval Latin version of the great astronomical *Almagest* of Ptolemy. Less well-known and widespread versions included a translation made directly from the Greek in Sicily shortly after 1160 by someone who was none too well qualified for the task either astronomically or linguistically, a third rendition from the Arabic, and yet a fourth from the Greek. When Michael Scot wished to quote from the *Almagest* he used the wording of Gerard's translation. Similarly Robert Grossteste quoted a passage from Michael's translation of Al-Bitrûgi with only slightly modified wording, and yet more extensive use of it was made by both Roger Bacon and Albertus Magnus.

[1] R. de Vaux, *Revue des sciences philos. et theol.*, 21 (1933), 195.

[2] Adelard translated the *Ysagoge minor* of Albumasar which was a condensation of the Arab's *Introductorium maius* only about one-fifteenth as long and purely astrological, on which Daniel of Morley heard Gerard of Cremona lecture later in the century: Richard Lemay, *op. cit.*, pp. 4–8, 315.

Gerard of Cremona furthermore had lost none of the earlier enthusiasm for astrology. Yet another Briton who had preceded Michael Scot at Toledo, Daniel de Merlai or of Morley, tells how amazed he was to hear the translator of the *Almagest* maintain the fatal influence of the stars and readily rebut the arguments against this which Daniel adduced from the Church Fathers. We shall find that Michael Scot, devoted to astrology as he was or became, did not assert the influence of the stars so baldly and uncompromisingly as Daniel represents Gerard as doing.

For the present it may be suggested that it was probably because the Ptolemaic system had already been adequately offered in Latin form that Michael Scot undertook the translation of the recent treatise by Al-Bitrûgi (called Alpetragi or Alpetragius in Latin) which reflected the earlier and somewhat antiquated and outmoded Aristotelian astronomy, with its homocentric spheres instead of the Ptolemaic epicycles and eccentrics. But it further introduced the theory of impetus, which was to become so prevalent in the fourteenth century, as stated by Simplicius in the sixth century of our era, who had explained the steady motion of the heavenly bodies by making their impetus exceed their gravity. This doctrine of impetus, which came to replace the Aristotelian explanation of accelerated motion as caused by the surrounding air, may further be traced back to Philoponus in the sixth century; and it was to serve its purpose until the modern introduction of the conception of inertia.

Gerard had already translated Aristotle's *De celo et mundo*, but Michael added a translation of the 'great commentary' of Averroes upon that work. This was completed after 1217, since in the preface, addressed to Stephen of Provins, Michael refers back to his translation of Alpetragius in that year.

> To you, Stephen of Provins, I especially commend this work which I, Michael Scot, have given to the Latin-speaking world from the dicta of Aristotle. And if Aristotle left anything incomplete in this book as to the constitution of the universe, you will find its supplement in the book of Alpetragi which I have similarly given to Latinity and in which you are well versed.

In at least one manuscript (in the library of St Mark's at

Venice, VI, 54, 14th century, fol. 1r, quoted in Valentinelli's catalogue, IV, 38), the words 'putting their meaning together' (*sententialiter coniungendo*) are added after 'the dicta of Aristotle.'

How long before 1217 Michael may have been translating at Toledo or elsewhere we seem to have no means of knowing. He translated other Aristotelian commentaries by Averroes, so that he has been held largely responsible for the introduction of Averroism into western Christian Europe, although—except for one brief allusion to unity of the intellect—he does not appear to have vouched for any Averroistic doctrine which was contrary to Christian belief, and definitely denied the transmigration of souls from our habitable zone 'through fire and water' to new bodies in the southern temperate zone, and their subsequent return to yet other bodies here. Here again it is to be noted that Averroes (1126–98), 'the greatest Moslem philosopher of the West,' was of the later twelfth century, so that the translations of Michael Scot familiarized the Latin world of the first half of the thirteenth century not merely with ancient Greek science, but also with recent writing and thought in Arabic.

Michael Scot's translation of the Aristotelian books on animals (i.e. *Historia animalium*, *De partibus animalium*, and *De generatione animalium*, which were all that the Arabs knew) seems to have been the first Latin version, completed by 1220 at the latest, and said in four manuscripts to have been executed at Toledo. This was used by Albertus Magnus in his *De animalibus*. Although William of Moerbeke, on 23 December 1260, completed another translation made directly from the Greek, that by Michael Scot was still used in the universities in the fourteenth century. All abbreviations and summaries of the Aristotelian zoology stem from it, and before 1500 it had been printed once separately and once with other works of Aristotle.

Gerard of Cremona was credited by his associates, in the bibliography of his writings which they drew up after his death, with translation of *De celo et mundo* and other books of natural philosophy by Aristotle. Extant are versions by him of the *Physics*, *De generatione et corruptione*, and the first three books of *Meteorologica*. The translation of *De celo et mundo* which opens '*Summa cognitionis* (*nature*) *et scientie* . . .' was ascribed by Martin Grabmann to Michael Scot, but *Aristoteles Latinus* gives

it to Gerard of Cremona, and that which opens '*Maxima cognitio nature et scientia demonstrans ipsam . . .*' to Michael.[1]

In the manuscripts the Latin translation of the commentary of Averroes on Aristotle's *De sensu et sensato* is sometimes ascribed to Gerard of Cremona and sometimes to Michael Scot. It seems more likely to have been by Michael, since Gerard was both born earlier than Averroes and died before him, while Michael, as we have seen, was especially interested in translating the Averroistic commentaries upon works of Aristotle.

In a manuscript of the thirteenth century which is now at Paris, three translations of Aristotle's *Physics* are presented in as many parallel columns: the old translation at the left, that by Gerard of Cremona at the right, and that of Michael in the middle. In another manuscript of the same century at Erfurt the old translation occupies sixty-four leaves in folio, accompanied by that of Michael Scot in their margins. A third manuscript at Yale University contains Averroes' commentary on the *Physics* as translated by Michael. In a fourth manuscript of the early fourteenth century one Theodorus is represented as beginning to translate the commentary of Averroes on the *Physics* at the request of the students at Padua, leaving Scot to complete it. But this would seem more likely to have been the other way round, since it was after Michael's death that he was succeeded by a Theodore as astrologer, *phisicus*, and *philosophus* at the court of Frederick II. It is probable that Michael had translated the text of the commentary without the commentator's preface, which Theodore added.[2]

The common text, or *versio vulgata*, of the *Compendia* on the *Parva Naturalia* of Aristotle is believed to have been the work of Michael Scot. He is also thought to have written a commentary on the fourth, non-Aristotelian book of the *Meteorologica*.[3]

Presumably also by Scot is a translation of Aristotle's *De*

[1] *Geistesleben*, II (1936), 147–8; AL, pp. 53, 104, 215; items 106, 1313.

[2] I am glad to find this view shared by Professor Wolfson, who in *Speculum* 38, (1963), 92, listing 'fifteen out of thirty-eight commentaries by Averroes translated into Latin during the thirteenth century directly from the Arabic,' assigns all seven in natural philosophy and metaphysics, including all four long ones, to Michael Scot, 'except for the Prooemium to the *Physics*, which is by Theodorus Antiochenus.'

[3] Wolfson lists Michael as translating Averroes' middle commentary on the *Meteorologica*. AL 106 reference to 105 should rather be to 654 (BN 15453, ff. 210v–214r) of which the opening and closing passages are quoted at length on 217–18. See TK 1071, '*Postquam divisum est quod principia . . .*' for other MSS.

*anima* with Averroes' commentary upon it, which commonly accompanies Scot's version of the commentary by Averroes on *De celo et mundo* in the manuscripts.

Of the several extant medieval Latin translations of the *Metaphysics* of Aristotle, some five in all, that in eleven books is called *Metaphysica nova.* It appeared about 1220, and omits the first four chapters of Aristotle's first book, all of Book XI, and the last part of Book XII. It is rarely found alone in the manuscripts, more often between the *Metaphysica vetus* and Books XIII–XIV of the middle translation, or in the Latin version of the commentary on the *Metaphysics* by Averroes, and undoubtedly the two were translated together. Lacombe in *Aristoteles Latinus* (p. 65) assigns it to Michael Scot as translator, although no manuscript of it bears his name.

It may be said further that, on the one hand, translations of yet other works of Aristotle have been attributed to Michael Scot without sufficient proof, and, on the other hand, that others may have been translated by him which have remained anonymous in the manuscripts, or have totally disappeared, or of which we have no record.

In 1210 a provincial council, which was primarily concerned with condemnation of a Master Amaury and David of Dinant for their theological teaching and writing, added:

> Neither the books of Aristotle on natural philosophy nor their commentaries are to be lectured on at Paris in public or in secret, and this we forbid under penalty of excommunication.

It seems likely that the books of Aristotle mentioned were the translations by Gerard of Cremona. However, about the same year, according to Rigord's chronicle of the reign of Philip II, 'certain books of Aristotle which taught metaphysics began to be read at Paris, brought recently from Constantinople and translated from Greek into Latin.'[1] Five years later, in 1215, the papal legate, in laying down rules for the conduct of the University of Paris, repeated this prohibition of lectures on the books of Aristotle on metaphysics and natural philosophy, or on summaries of them. This prohibition would not apply to works by other authors on the quadrivium (arithmetic, geometry,

[1] *Magic and Experimental Science*, II, 313, n. 1.

music, and astronomy) such as the *Sphere* of Sacrobosco, composed early in the century while he was teaching at Paris.

In 1229, because of a quarrel with the city authorities, masters and scholars left Paris. Among the inducements that the newly founded University of Toulouse held out to them was that

> . . . those who wish to scrutinize the inmost bosom of nature can hear here the books of Aristotle which were forbidden at Paris.

On 13 April 1231 Pope Gregory IX induced the masters and scholars to return to Paris by granting them various privileges, but still stipulated that

> . . . those books on nature which were prohibited in provincial council for certain cause, they shall not use at Paris until these shall have been examined and purged from all suspicion of error.

On 20 April, however, he ordered the absolution of those who had violated this prohibition; and on 23 April he appointed a committee of three to examine the same books and remove anything erroneous or likely to excite suspicion, so that 'the rest may be studied without delay and without offence.'[1] One member of this committee was Stephen of Provins, to whom Michael Scot had addressed the preface to his translation of Averroes' commentary on *De celo et mundo*.

In 1266 Roger Bacon stated that Michael Scot had appeared in the year 1230 with parts of the works of Aristotle in natural philosophy and metaphysics; that before this only the logical treatises of Aristotle and a few others translated by Boethius had been known in the West; but that, ever since, the philosophy of Aristotle had been 'magnified' among the Latins. In view of the translations by Gerard of Cremona, and the prohibitions just mentioned on teaching from the books of Aristotle in natural philosophy and metaphysics at Paris, Bacon seems to have been mistaken. But some truth may lie hidden behind his statement. Michael Scot may have been making a new set of translations at Toledo or elsewhere to replace those whose reading had been prohibited at Paris. He was *persona grata* with Honorius III and Gregory IX, who spoke highly of his learning in 1224 and 1227. He may well, therefore, have been connected closely, not indeed with the first introduction of Aristotle's works on metaphysics

[1] For the quotations see my *University Records and Life*, 1944, pp. 34, 38–40.

and nature, but with their revision and enlargement, as well as their explanation by Averroes. But what an irony! In order to make Aristotle more palatable to Christian readers, he was served with an Averroistic sauce!

Michael Scot knew some Greek, and in one or two manuscripts translations by him are said to have been made from that language.[1] That little reliance is to be placed on such statements may be illustrated from two items in a huge double-columned folio, written in tiny letters, of the fourteenth century at Paris (BN 14385). Across the top margin of the first leaf is written in Latin:

> The prologue opens of the commentary on the book *De celo et mundo*, which the philosopher Averroes commented on in Greek, and Michael Scot translated into Latin.

After several other works, across the top margin of fol. 132r is written:

> The commentary opens of the book on the Soul of Aristotle the philosopher, which Averroes commented on in Greek and Michael Scot translated into Latin.

But Averroes of course wrote in Arabic! This, however, is not to deny value to the texts as translations by Michael from the Arabic.

Gregory IX, in 1227, spoke of Michael's proficiency, not in Greek but in Hebrew and Arabic as well as Latin. It is therefore tempting to hold Michael responsible for the standard Latin version of the *Guide to the Perplexed* of the leading Hebrew man of learning, Moses Maimonides (1135–1204), which is found together with Scot's translation of *De celo et mundo*, albeit in a different hand, in a manuscript (601) of the thirteenth century at the University of Paris. In it is also a summary of Maimonides' teachings, made for one Romanus, presumably the Romanus who was cardinal of S. Angelo, in the eighth year of the pontificate of Honorius III, who in the same year recommended Scot to the Archbishop of Canterbury for a church living.

[1] At Cambridge, in the University Library, Latin MS 205 (Dd.IV.30), 14th century, fols. 1–150v, '*Incipit liber Aristoteles de natura animalium quem transtulit magister Michael Scotus de Greco in Latinum.*' But Michael's translation was from the Arabic.

If these two works were by Michael Scot, they would appear to have been undertaken and completed in Italy, after he had left Toledo. This had happened by 1220 at the latest, when we find him in Bologna adding a sworn statement to the manuscript of his translation of the Aristotelian texts on animals. Indeed, his dating the statement according to the Pisan calendar suggests that Bologna was not his first stop in the Italian peninsula.

Although he had already before 1220 translated nineteen books of Aristotle on animals, Michael subsequently translated for the Emperor Frederick II the briefer work on animals by Avicenna, a Persian who died in 1037, which was based on Aristotle. This *Avicenne Abbreviatio de animalibus* was copied by a Henry of Cologne from the Emperor's original text in southern Italy and finished on 9 August 1232. A number of copies of Henry's copy are found in manuscripts of the thirteenth century. One at Florence (FL S. Crucis XIII, 9), made in 1266, also includes Michael Scot's translation of the nineteen books of Aristotle on animals and William of Moerbeke's translation of four of them, made in 1260. From another, now preserved at Bruges (MS 464, fol. 76r), we may quote the original Latin:

> Completus est liber Avicenne de animalibus scriptus per magistrum Heinricum Coloniensem ad exemplar magnifici imperatoris domini Frederici apud Messinam civitatem Apulie, ubi dominus imperator eidem magistro hunc librum promissum comodavit anno domini 1000, 200, 32 in vigilia beati Laurentii in domo Volmazi medici imperatoris. Liber iste inceptus est et expletus cum adiutorio Ihesu Christi qui vivit etc.
>
> Frenata penna finita nunc Avicenna
> Libro Cesareo gloria summo deo!

A manuscript of 1258 at Erfurt is perhaps not derived from Henry's, since it states that these eighteen [*sic*] books of Avicenna on animals were copied at Montpellier from the *exemplar* (i.e. the original or standard version) of Master Bernardus Columbus. Michael Scot's translation of Avicenna's *De animalibus* was to be printed at Venice in about 1500. The Arabic and Hebrew manuscripts from which Michael made his translations are now lost, or at least have not been traced.

As yet only one of Michael Scot's translations has been issued in a critical edition—that of Al-Bitrûgi in 1217 by Francis J.

Carmody in 1952. Michael's method of translating had previously been regarded as literal, so that, in the case of Aristotle on animals, although his version was from an Arabic translation and not from the original Greek, it proved useful in establishing and reconstructing the latter. With this Carmody in general agrees, stating:

> The syntax depends to an exceptionally large extent on that of the Arabic; since this was reproduced verbatim, so far as possible, the high frequency of abstract and verbal nouns and participles is understandable (p. 19).

But Carmody further states that Michael's choice of words 'varied within a very few years,' that his vocabulary expanded rapidly, and that unnecessary synonyms were forged by him.

Although Michael seems to have translated with Jewish assistants, this conclusion of Carmody indicates that he took an active part himself, and leads us to qualify the criticism of Roger Bacon who, after stating that Hermannus Alemannus had Saracens with him in Spain, who were largely responsible for his translation, added:

> Similarly Michael Scot ascribed many translations to himself. But it is certain that Andreas, a Jew, did more work on them.

The translation of Al-Bitrûgi, however, was *cum Abuteo levite*, not Andreas, while Carmody's suggestion that Abuteus may have dictated to Scot in Spanish overlooks the fact that Michael would have had to learn Spanish first.

Roger Bacon further condemned Michael and other translators of his time, except Grosseteste, as knowing 'neither sciences nor languages, not even Latin,' while Albertus Magnus remarked in one place that Michael Scot did not really understand nature nor the works of Aristotle. Yet Grosseteste quoted a passage from Michael's translation of Al-Bitrûgi with only slightly modified wording; Bacon and Albertus made even more extensive use of it; while Albertus, in his own *De animalibus*, copied the errors in Scot's translation without noticing them. When Peter Gallego, who had been confessor to Alfonso the Wise (1252–84) before that monarch's accession, and who became the first bishop of Cartagena from 1250 to his death in 1267, trans-

lated the *History of Animals* from an Arabic abridgement, he made use of Michael's previous translation.

The number of extant manuscripts is no sure test of a work's influence. But not only are those of translations by Michael Scot more numerous than those of his own compositions; they are also more complete. They are even more modern, acquainting the Latin world of the early thirteenth century with Arabic science and thought of the late twelfth, as well as with an expansion and revision of the texts of Aristotle. It therefore seems fair to say that, despite his contemporary reputation for learning and prediction, he played a more prominent part and exerted a greater positive influence in intellectual history as a translator.

But, after a fourth chapter on his later years, we shall turn in the succeeding chapters mainly to his own works for his own fund of knowledge, his reflection of the Western Christian view of nature and science in the early thirteenth century, for its society and his personality.

# IV · Later Years: 1220–35

We have seen that Michael Scot was in Bologna in the year 1220. Frederick II, the Holy Roman Emperor and King of southern Italy and Sicily, was returning from Germany and was in the vicinity of Bologna at this time, and it is possible that Michael Scot may have then entered his service. It has usually been assumed that this did not happen until after the papal efforts of 1224–7 to obtain benefices for Scot had ceased. But this leaves the years 1220–3 unaccounted for, and ignores the possibility that the Popes may have been acting for Michael at the Emperor's request. Honorius III (1216–27) had been Frederick's boyhood teacher and maintained friendly relations with him as Pope. Gregory IX (1227–41) was soon at odds with the Emperor, but he did not write on Michael's behalf after 28 April 1227. And it was not until 29 September that Frederick was excommunicated for failure to embark on the Crusade. After that it would have been useless for him to ask the Pope to do anything for Michael, while the latter's employment by an excommunicate would tend to blacken his own reputation, and lend itself to suspicion and charges of evil and diabolical magic, which led Dante, advocate of the Empire as he was, to locate Michael in the Inferno. Frederick was freed from excommunication on 28 August 1230, and was excommunicated again in 1239 on Palm Sunday. About midway between these two dates Michael Scot died. All his writings of undisputed authenticity—other than translations—were composed at the request of the Emperor, with whom he also engaged in learned conversation, and for whose military campaigns he made astrological surveys and predictions. Apparently, once he had entered Frederick's service, whenever that was, he usually accompanied him wherever he went. It may be argued, however, that this was not before 1224,

when Frederick founded the University of Naples, or he would have found employment for Michael there.

On 16 January 1224 the Pope wrote to the Archbishop of Canterbury to provide a suitable living for Michael Scot, 'who flourishes among other men of learning with a singular gift of science' (*qui inter litteratos alios dono vigeat scientiae singulari*). Apparently this benefice was insufficient and also held *in absentia*, for on 18 March the Pope wrote again, allowing Michael Scot 'because of the merit of his science and notwithstanding the constitution of the Lateran Council, to obtain two benefices, although they have the care of souls.' On 31 May the Pope confirmed Michael, 'in view of the grace of science which the Lord has conferred on him,' in his possession of these holdings, notwithstanding his recent election as archbishop of Cashel in Ireland, a lucrative post. Scot, however, evidently felt that this election called for residence, and, because he did not know Irish, conscientiously resigned (*magister M. Scotus ignorans linguam terrae illius, regimen ecclesiae Cassellensis spontaneus resignaverit*). On 9 May 1227, 'in view of his knowledge (*scientia*) of letters, for which he should be honoured by more benefices, especially by the Apostolic Seat, which delights in erudite men,' Michael was given a second parochial benefice in England and two in Scotland.[1]

Michael Scot thus appears as a cleric, but not a member of the new religious orders, which may help to explain the unfavourable retrospect on him of Albertus Magnus, a Dominican, and Roger Bacon, a Franciscan. Yet, as we have seen, while Michael placed a philosopher, if he dies in the Lord, among the cherubim, he also put 'a member of a religious order, loving the Lord well,' among the seraphim. In this connection may be further noted the greater number of manuscripts of the more systematic and complete, if less original, encyclopedias by members of those orders, like Bartholomaeus Anglicus, the Franciscan, and Thomas of Cantimpré and Vincent of Beauvais, the Dominicans, than of Michael's *Liber introductorius*.

In 1202 Leonardo of Pisa, 'the greatest Christian mathema-

[1] Pietro Presutti, *Regesta Honorii Papae III*, II (1895), Nos. 4682, 4871, 5025, 5052, 5470. In a bull to Henry III of England, Honorius called Scot 'a man indeed famous for upright morals and renowned for eminent knowledge of letters': Latin text by Haskins in 'Two Roman Formularies in Philadelphia,' *Miscellanea Ehrle*, IV (1924), 281.

tician of the Middle Ages,' had finished the first version of his magnum opus, *Liber abaci*, which not merely gave the first full and systematic Latin account of the Hindu-Arabic numerals, but provided more exact demonstrations than did writers in Arabic, and initiated a new and original development of Greek as well as Arabic mathematics. Leonardo had followed it up by a *Practica geometriae* in 1220, and two briefer but even more original treatises in 1225 (GS, II, 612), which resulted in his being introduced to Frederick II, and discussing mathematical problems with a John of Palermo who was in the Emperor's train.

Michael Scot, who does not seem to have been present on this occasion, wrote to Leonardo asking for a copy of *Liber abaci*, and this request led the latter to issue a revised version of it in 1228, with the following preface addressed to Michael:

> You have written to me, my lord Master Michael Scottus, supreme philosopher, that I should transcribe for you the book on numbers which I composed some time since. Wherefore, acceding to your demand and going over it carefully, I have revised it in your honour and for the use of many others. In this revision I have added some necessary matters and cut out some superfluities. In it I have given the complete doctrine of numbers according to the method of the Hindus, which method I have chosen as superior to others in this science.
>
> And since arithmetic and geometry are connected sciences and support each other, the doctrine of numbers cannot be fully set forth, unless some geometry is introduced or matters relating to geometry, which here are worked only according to numerical method, which method is taken from many proofs and demonstrations that are made by geometrical figures. But in another book, which I have composed on the practice of geometry, I have explained more fully those which pertain to geometry and yet others, demonstrating particular points by subjoined geometric proofs.
>
> This book indeed regards practice more than theory. So those who wish by it to know well the practice of this science, should engage in its practice by continuous usage and prolonged exercise, so that, knowledge through practice having become habitual, memory and intellect so concord with hands and figures, that as it were by one impulse and breath in one and the same instant they work together in every respect about the same thing. And when a pupil has once attained this habitude, he can gradually come easily to perfection therein.
>
> To make the doctrine more apparent, I have divided the book into fifteen chapters, so that the reader may more readily find whatever

he is looking for. Furthermore, if in this work inadequacy or defect is found, I submit that to your emendation.[1]

Scot's own works, or magnum opus in three parts, addressed to the Emperor Frederick II, *Liber introductorius*, *Liber particularis*, supplementary to it, and *Liber physiognomiae*, are difficult to date. The first seems incomplete in all manuscripts of it, refers to Francis of Assisi as a saint (he was beatified on 16 July 1228), and was probably left still unfinished at Michael's death. The briefer *Liber particularis* contains answers to questions by Frederick perhaps inserted in the meantime to satisfy him, much as the briefer *Abbreviatio Avicenne de animalibus* was added to the translation of Aristotle's nineteen books. *Liber particularis*, like *Liber introductorius*, lacks unity and systematic arrangement, so that it is not surprising that *Liber physiognomiae* was the only one of the three to be printed.

In one passage of *Liber introductorius* it is stated that, according to the method of those who composed the calendar, the sun enters a new sign of the zodiac on the fifteenth of the Calends 'of the following month, in which this notice is written' (M, 122va), but that does not help us much in dating the work.

That Scot may have accompanied Frederick II on his brief crusade of 1228–9, in which he obtained by negotiation with the Sultan partial possession of Jerusalem, together with Bethlehem and Nazareth, and peaceful access for Christian pilgrims, is suggested by a passage in *Liber introductorius* concerning that zone in which lie Crete and parts of the Byzantine empire (Roumania). There the weather is always fair, with a maximum of sunlight and starlight.

> And that this is so we know by experiment [or, personal experience] . . . because, since such places are very hot, the vines yield an odoriferous and very potent wine, as is evident in that of Crete, Malvasia, Cyprus, and Damascus, since there fogs never rise nor dark clouds nor thunderstorms (M, 46ra).

We have heard Roger Bacon give the impression that Michael Scot introduced a new Aristotle in 1230, a year when the masters

[1] Latin text in Libri, *Histoire des sciences mathématiques en Italie*, II, 288–9; Baldassarre Boncompagni, 'Della vita e delle opere di Leonardo Pisano,' *Atti dell' Accademia pontificia de' Nuovi Lincei*, Rome 1852, 25–7.

and scholars had abandoned the city of Paris. If he did not accompany Frederick on the crusade, he might have been teaching at Paris in 1228–9. But it would fit the rough date 1230 better if he did not go there until after the crusade, and the return of the university early in 1231. If so, we may surmise that he not only lectured there on works of Aristotle, but also delivered the eighteen lectures which constitute the commentary on the *Sphere* of Sacrobosco, which was later printed under his name, and of which portions are to be found in extant manuscripts, with its concluding allusions to the city of Paris. In *Liber particularis* Scot refers to 'the Parisian treatise of rules, to which *Sphere* in our teaching we added the circles of the planets' (H, 291, n. 118).

That is to say, as became customary in medieval universities, Michael added to the more elementary *Sphere* lectures on the more advanced subject of the theory of the planets. He goes on to state that he placed the circles or spheres of the planets, designating the days and months of the year and periods by determined measures, 'placing the planets in their houses naturally just as they are located in their epicycles.'[1] This indicates that Michael accepted the Ptolemaic system, although he had translated Al-Bitrûgi, an author who did not. A copy of what professes to be this *Theory of the Planets* by Michael, or rather a part of it, is preserved in a manuscript of the thirteenth or fourteenth century at the Vatican (Palat. lat. 1363, fols. 90ra–94rb), which closes:

> Here ends a summary of the arguments of the treatise on the theory of the planets according to the opinion of Michael Scot, and it breaks off here in this chapter because of the break in the exemplar.

In another manuscript (Oc) a fuller anonymous text follows Scot's *Liber particularis* and the *Physiognomy*. In Appendix IV is given a text based upon both manuscripts. But this text agrees with that found under the name of Gerard of Cremona rather than with Michael's above description of his lectures on the subject.

[1] An astrological 'house' was one of the signs of the zodiac or a twelfth part of the heavens; an 'epicycle,' the small circle having its centre upon the circumference of a greater circle. In order to save the supposedly circular movement of the planets, they were supposed by Ptolemy to move in such epicycles.

There has for a long time been doubt as to the authenticity of the ascription of this *Theorica planetarum* to Gerard of Cremona, the translator of the *Almagest*. It was not listed by his friends immediately after his death, but they limited their bibliography to Gerard's translations. Regiomontanus (1436–76), in his *Disputationes super deliramenta theoricarum Gerardi Cremonensis*, used such qualifying phrases as '*Theoricas planetarum Gerardo cremonensi ut fertur editas*,' and '*Theoricas dictas Gerardo quodam: ut fama est: cremonensi editas*.' In the previous manuscripts it is often found anonymously, although the distinctive wording of its incipit, '*Circulus eccentricus vel egresse cuspidis . . .*' tended to identify it.

In Michael's commentary on the *Sphere* such questions are discussed as whether the world is from eternity, whether it is one or many, whether it will sometime end, what its form or figure is, whether there is a ninth sphere, whether a round body is moved more readily than an angular body, whether the earth is habitable at the equator, how many elements there are, whether they are transmuted, whether fire is hot in its own sphere, whether water surrounds the earth, whether the ethereal region is moved about the elementary, whether the heavens are moved by one mover, whether their movement is natural or violent or voluntary, whether the heavens are an animated body, whether they are moved faster than the stars, and whether uniformly.

Such questions are suggested by the works of Aristotle rather than the text of Sacrobosco, and we find Aristotle cited four times without mention of any particular work, while his *De anima* is cited four times; *Posterior Analytics*, once; the *Metaphysics* or *Prima philosophia*, thirteen times; the *Physics*, twenty-six times; *De celo et mundo*, twenty-three times; *De generatione et corruptione*, eleven times; *Meteorologica*, ten times; and *De sensu et sensato*, thrice. As against this Plato is cited some seven times; Alfraganus, thrice; Euclid, thrice; Boethius, *De consolatione philosophiae*, twice; and Theodosius on spheres, Mercurius *De vita deorum*, the pseudo-Aristotelian *De proprietatibus elementorum*, *De substantia orbis*, Virgil, *De causis*, *De plantis*, and Avicenna, once each.

This commentary on the *Sphere* of Sacrobosco, then, bears out Roger Bacon's assertion that Michael Scot introduced a new

Aristotle, and some of its passages are similar to ones in *Liber introductorius*.

In a manuscript of the thirteenth century, prophetic verses as to the fate of Italian cities are followed by this statement:

> These verses and many others were made by Master Michael Scot at Bologna in 1231 at the instance of the *podestà* and many other nobles, who asked him to reveal by the art of astrology the outcome for those cities of Lombardy and the March [of Verona?] which had bound themselves by an alliance against the Emperor Frederick, and also for other cities which favoured the Emperor.[1]

This would presumably have happened on Michael's return to Italy from teaching in Paris. The verses, however, have generally been regarded as apocryphal, or at least as altered after the event.

In any case, Michael died while in the service of the Emperor. On 15 July 1235 Frederick II had married Isabella of England, and the Norman poet, Henry of Avranches, became attached for a time to the imperial court. In a poem addressed to the Emperor, written after Frederick had decided upon war against the Lombard cities, but before he began it in 1236 Henry recalls a prediction of Michael Scot,

> Who was a watcher of the stars, who was an augur,
> Who was a soothsayer, and who was a second Apollo.

[1] This statement, as distinct from the verses, is found only in Brussels, Dukes of Burgundy 11956–66, parchment folio of the thirteenth century, fol. 98r–v, where after fifty-five verses is written:

> Hos versus et plures alios fecit magister Michael Scottus apud Bononiam MCCXXXI ad instantiam potestatis et aliorum multorum nobilium, qui querebant ab eo, ut secundum artem astrologie revelaret eventum civitatum Lombardie et Marchie, que per societatem se alligaverant contra Fredericum imperatorem, necnon et aliarum civitatum, que favebant ipsi imperatori.

Quoted by O. Holder-Egger, *Neues Archiv der Gesellschaft fur ältere deutsche Geschichtskunde*, XXX (1905), 866; see also p. 851. He said that it was very difficult, if not impossible, to ascertain the original form of the verses. Roland de Vaux (1933), p. 204, states that it was on 26 October 1231 that the *podestà* of Bologna and other Lombard leaders asked Michael Scot '*ut secundum astrologiam revelaret eventum civitatum Lombardiae et Marchiae*,' who had formed a league against the Emperor Frederick. If so, Michael would scarcely seem to be in the imperial service then.

There are such verses in the oldest manuscript of *Liber introductorius* (P, 124v), including one addressed to the Emperor: '*O bone imperator, tu eris imperator amatus et odio plenus . . .*' (you will be loved and full of hate). The further prediction, 'You will lose your eyes, but through you the blind will see,' does not apply well to Frederick II (P, 124v). E, 122rb has a different prophecy addressed to the Emperor and predicts the coming of Antichrist in 1260.

When many persons put many questions concerning the Empire, Michael said that he had proved by sure reason that the state of the Empire would resurge with Frederick's support.

> As he was about to say more, he became silent, and,
> Not permitting his secrets to be published to the world,
> Bade that his breath be spent on thin air.
> Thus the inquisitor of the Fates submitted to Fate.

A note in the Paris manuscript says that the verses concerning the fate of the Italian cities were recited by Michael to Frederick II before he left Germany for the last time, which was early in 1236 (H, p. 276).

Different and less reliable than this contemporary account of Michael's death is that found in the chronicle of Francesco Pipini, a Dominican who in 1320 visited Jerusalem, Egypt, and Constantinople, and who translated the narrative of Marco Polo into Latin. He repeats the report that Michael had discovered that he would be killed by a small stone of a certain weight, and so invented a new protective covering for the head called *cerebrerium* or *ceroboterium*. Riccobaldi of Ferrara at the close of the thirteenth century had attributed the same invention to Michael, but without connecting it with his death:

> qui usum invenit armaturae capitis quae dicitur *cervilerium*.

Pipini continues that one day, while attending mass, Michael removed this headgear at the elevation of the host, whereupon a small stone fell from the vault and wounded his head slightly. But when he weighed it and found it to be of the weight he feared, he arranged his affairs and shortly after died from that wound,[1] verifying the saying of Josephus that men cannot escape fate, even if they foresee it. In any case the tale illustrates the emphasis which Michael Scot put upon number, measure, and weight.

[1] Muratori, *Scriptores*, IX, 1280. 660, 67. For a similar story concerning the death of the chiromancer Cocles in the sixteenth century, *Magic and Experimental Science*, V (1941), 52.

# V · The Universe of Michael Scot

The universe, for Michael Scot, included all being, spiritual as well as material, from angels to the lowest forms of animate and inanimate objects on earth, and from heaven to hell. Even God is thought of as within, rather than outside, the universe which He created.

> If it is asked, Where resides the God of gods, and Lord of the rulers of the universe of earth and heaven? we reply that, although He is everywhere potentially, yet He is substantially in the intellectual heaven (O, 4ra; P, 13rb).

which, Michael goes on to explain, is the empyrean heaven. In other passages God is variously located at the centre of the heavens, as the heart is at the centre of an animal's breast (M, 46vb), or to the south (*in meridie est sedes dei:* M, 28ra; p. 45r).

In the commentary upon the *Sphere* of Sacrobosco, Aristotle, *De celo et mundo*, is cited that the heavens are the place of God and spirits (T, 279). But presently it is added, in words which remind one of the later *De docta ignorantia* of Nicholas of Cusa:

> God is everywhere, because He is a sphere incircumscriptible, whose centre is everywhere, circumference nowhere, not raised above all, not included within all, alpha and omega, beginning and end. And as the heaven is not moved from place to place, so is God immobile. So is the place of God (T, 280).

As against this normal conception of a single universe, in one place four worlds are distinguished, which, however, turn out to be sub-divisions of it. The first *mundus* is of God and spiritual; the second is the firmament in which are the fixed stars and planets; the third is that of the four elements; the fourth is man the microcosm. Other passages distinguish between a superior

*mundus* enclosed by the ninth sphere or *primum mobile*, and an inferior elementary *mundus*. Scot even adds a mercantile world, which perhaps may be taken to correspond roughly to man the microcosm (M, 89va). The ether is sometimes assigned to the celestial world, extending from the sphere of the moon to that of the fixed stars (M, 50vb; P, 54v), sometimes to the elementary world (*mediante ethere qui est aer temperatissimus et purus*, M, 89vb; O, 122vb).

The shape of the universe is spherical, like an egg or a ball used in sport, with the empyrean heaven outermost, enclosing the firmament of the fixed stars and the successive spheres of the planets from Saturn to the moon, with the zodiac crossing the equator and touching the two tropics of Cancer and Capricorn, and marking the movement of the seven planets through the twelve signs, contrariwise to the movement of the spheres. Then come the four elementary spheres of fire, air, water, and immobile earth, with the inferno at its centre. Some compare the sphere of fire to the shell of an egg; that of air to the skin inside the shell; that of water to the white of the egg; the earth to the yolk of the egg; and the drop of fat inside the yolk to the inferno. Others compare the ninth sphere to the eggshell; the sphere of fire to the inner skin, because of its purity and subtlety; that of air to the white of the egg, because of its humidity and clarity; that of earth to the yolk, because of its thickness and fragility; that of water to the drop of fat (O, 122va). Elsewhere the universe is likened to an onion and its successive spheres to the onion's layers (E, 63ra).

Despite his subsequent tendency to digression, Scot lost no time, in the prologue to *Liber introductorius*, in declaring all things subject to the power of one eternal God, with whom he identified First Cause and First Mover, whom he glorified with many adjectives (O, 1ra–b), and by whom the universe was created, for it had not existed from eternity, as many held (O, 1vb).

> Created substance had its origin from uncreated, as every effect is produced by the power of efficient cause (M, 1ra).

This leads to an account of creation, based primarily upon that in the first chapter of the Book of Genesis in the Bible. But in

the meantime Scot has said that, once the movements and natures of the superior celestial bodies have been mastered, it is easy to learn those of inferior terrestrial bodies which are dependent upon them, and that from the seven planets and twelve signs of the zodiac much can be learned as to the future. He also has alluded to the doctrine that the heavenly bodies resume their former positions every 36,000 years—a number reduced to 532 by the Paris codex in another context (P, 75r) and in a marginal quotation from Scot in a third manuscript of the astrological works of Abraham Avenezra. He has compared the influence of the planets to the action of the magnet; and has noted the vicissitudes of human fortune, in which the good are deprived of their possessions and the impious enjoy them, the wise suffer and fools prosper, in support of which assertion he quotes Solomon.

Coming to creation, we are told that on the first three days God produced *spiritualia,* such as angels and empyrean heaven, stars and pure elements; on the other three days *corporalia et visibilia* such as compounds of the elements, birds, fish, and man (E, 3ra). The first day of creation was 18 March, where the letter *g* is written in books of computus, when the sun entered (or would have entered, had it already been created) the sign Aries, and when God on the day of eternity created spiritual light, which is called heaven and angelic nature. On the second day He distinguished spiritual creature from corporal. On the third day He made sea and earth. On the fourth day He made temporal day, namely, the sun for artificial day, and the moon and stars for night, according to the Escorial manuscript (3ra):

> placing fire on high, which materially is called ethereal, on which account the superior bodies are said to be of fiery nature. But they are not fire, nor in it.

According to the Munich manuscript:

> whose being He located substantially in the supreme element, of which a fourth [or, superior] part is called ether, just as the inferior part from the lunar globe to earth is termed air. And for this reason the celestial bodies are said by many, and believed to be, of fiery nature. But they neither are of fire, nor in fire (M, 2ra).

This tendency to confuse the ether with purest air or fire occurs elsewhere in Scot's work. On the fifth day God made the birds

in air and fish in water, knowing that the birds would stay in the lower part of the air, and the fish in the thicker part of the water, whether fresh or salt. On the sixth day He created terrestrial animals and last of all, man. Man was created from earth, the vilest element, to take the place of the devil and fallen angels.

In at least one manuscript this account of creation is preceded by the statement that God created everything in the flash of an eye, all together and at once. Solomon is quoted (E, 32rb):

> Qui manet [*vivit* in the Vulgate] in eternum creavit omnia simul.

But it is added that, in so far as we are concerned, He distinguished creation by parts in six days.

Such questions are raised as why the world was created; why God, when prepared to create the universe, merely said, 'Let there be light'; and why man was created last, although nobler than other creatures. In the Escorial manuscript (15vb) the exact hour of the creation of Adam is discussed, and it is explained that, before the creation of sun, moon, and stars on the fourth day, day and night had been distinguished by the light created on the first day. Solomon is again quoted:

> *Qui manet in eternum creavit omnia simul et semel*, that is, heaven and angels, celestial bodies as sun and moon, the four elements in the shape of confused matter which is called chaos; and this before any temporal day.

These dissonant passages are further complicated and contradicted by the statement that twenty-two different creatures were produced during the six days of creation.

A somewhat different account of creation occurs in the Bodley manuscript (O, 3va). When God said, 'Let there be light,' He created the empyrean heaven and the angels 'simultaneously and in one moment.'

> Afterwards He created seven heavens under the name of firmament, that is, the paths of the seven planets and the zodiac, in which are the fixed stars.

Then He created below the four elements and divided the superior from inferior waters, and sweet waters from bitter. He made man's body with His own hands from only an ounce of the

dust of earth and endowed it with a rational soul, as is proved by Genesis and the Psalmist. After that He created nothing and rested from all work. 'And so,' continues the Escorial manuscript (E, 73ra), 'neither souls nor stars are made anew.'

Things spiritual, or angelic nature, which includes the divine, come first in Scot's consideration of the universe. He asks: What is an angel, and how many orders of angels there are? (O, 4vb–5ra), although he has already mentioned nine orders in the empyrean heaven; have angels individual names like men? (O, 5rb), and further queries as to the tenth part of fallen angels or demons. They do not know everything, although they know more than man does concerning nature. Do they know the future? Not fully *per se* (O, 6rb). What of the good angels who did not fall from heaven, after the lapse of the bad angels? And so on. Perhaps the Emperor, Frederick II, is supposed to put these questions, which resemble some of those asked by him in *Liber particularis*, but this is not definitely stated. The Bible is much quoted, and the text reads more like a theological *Summa* than an introduction to astrology.

Next come a discussion of God and His being, followed by a much longer treatment of the Holy Trinity (O, 8v–11vb).

> We have this similitude of the Trinity in the rational soul, namely, intellect, reason and memory, and these three are one.

This, however, is merely an illustration. Michael does not attempt to identify the three persons of the Trinity with Power, Wisdom, and Will, as William of Conches had done and been forced partially to retract a century before.[1]

The first *Distinctio* of *Liber introductorius* opens with an account of the heavens and their motion, and cites *De celo et mundo* of Aristotle. Of 'the circles of the seven planets and the virtues which rule them in the heavens,' Michael says:

> Blessed God, and Father [Creator, P, 47r] of all creatures visible and invisible, placed above the four elements a fifth essence, in which He distinguished seven provinces (O, 28r).

These are further compared in the Escorial manuscript to the successive layers of an onion (E, 63ra),

[1] *Magic and Experimental Science*, II, 59–60. He abandoned the view that the Father was Power, and the Holy Spirit, Will, as lacking scriptural authority.

and in each a luminous body to signify *ex officio* things caused in inferior bodies. . . . Indeed, those planets are like the judges of cases, by whom various questions of litigants are judged.

The planets themselves, however, rule nothing, but are ruled by divine virtues. Some say that they are moved by angels; others, by winds. Michael holds that the divine virtues which move them are spiritual, not corporeal; but that not much more can be said of them, since they are but imperfectly known to man, and naturally always will remain so (O, 28v).

As for winds, Michael promises to discuss them in *Liber particularis*, but then goes on to say a good deal about them here, speaking of a legion of spirits damned in one wind (M, 23ra; O, 29vb), of many weather changes beneath the sphere of the moon, and stating that a physician should know the state of the moon and wind.

In the Paris manuscript (P, 42r) such celestial virtues are compared not to columns supporting edifices reared by the exercise of mechanical art, but to suspending cables and the action of the magnet. It is further stated that the four cardinal winds are said by the sages of the world to be four such virtues. Their names are given; then, after two badly blurred leaves, it is reiterated that the winds are divine virtues. Presently it is added that the seven planets are impelled by seven very strong winds (P, 47r). But these last two assertions do not agree with Michael's more cautious opinion as expressed above from other manuscripts.

Despite the story of Frederick II and the church tower recounted in a previous chapter, it is stated in several passages that the distance from earth to the heavens is unknown. The Paris manuscript affirms that the ether beyond the sphere of the moon is 'without known measure of latitude and longitude.' In the Escorial manuscript (E, 74ra) various past estimates of distances to the planets are reviewed. Pythagoras gave the distance from earth to moon as 125,000 *stades*, thence to the sun as double, and thence to the fixed stars as triple. 'In this he erred greatly.' 'A certain philosopher in his *Computus*' estimated the distance from earth to moon at 15,625 miles, from moon to Mercury 7,812½, from Mercury to Venus and likewise from sun to Mars 13,336 miles, from Mars to Jupiter and likewise Jupiter

to Saturn 7,812, from Saturn to the zodiac or sphere of the fixed stars 33,436, from the zodiac to the ninth sphere or empyrean as many as from earth to zodiac,

> from the empyrean heaven to the tenth heaven, in which God is happily eternal in eternity, ten thousand times as much as from earth to the empyrean. And perhaps as much more as is greater by the sum of these numbers, which larger figure I firmly believe.

Presently the following figures in miles are given for the breadth of the sphere of each planet:

| | | |
|---|---|---|
| Moon | 99,505 | |
| Mercury | 334,288 | |
| Venus | 197,250 | |
| Sun | 235 | |
| Mars | 24,872 | |
| Jupiter | 17,919,250 | |
| Saturn | 18,541,250 | (E, 74rb), |

'according to the opinion of Alphraganus which pleases us.' But Michael soon adds that he neither denies nor affirms that the aforesaid estimates are true or false; that sages disagree as to this; and that Aristotle said that science was not about particulars. Later he further says that no one should marvel if he does not affirm such views himself, but that such is the opinion of Alphraganus (E, 74va). Still later it is asserted that the magnitude of the heaven which is the ninth sphere or empyrean cannot be determined (E, 106va). Yet it had been said earlier:

> Now it remains to see, as we promised . . . how far it is from the earth to the heaven of the moon, and so of others to the zodiac and from the zodiac on high to the ninth heaven, and from the ninth to the tenth (M, 54rb).

As air grows purer and more subtle, the farther it is removed from the surface of earth and water,

> and seems to us more beautiful in colour, and is recognized as healthier for living beings,

and as fire is separated from the heavy world as far as it can rise on high, so what seems an empty void above the four elements from the moon to the sphere of the fixed stars is occupied by the

ether, a substance purer and more subtle and splendid than air or fire, although once, as we have seen, it is described somewhat inconsistently as 'most temperate and pure air.' In extent greater than the entire mass of the four elements, it is the flower of the other elements, like the odour of an unguent or other confection of many spices, and is the medium between celestial virtue and inferiors. Angels and demons may assume bodies from it (M, 57vb; P, 54v).

Michael Scot accepted the current notions of five zones, and of seven climes in the northern temperate zone. The latter are discussed twice in *Liber introductorius* in passages almost eighty leaves apart (M, 43va–44ra, 120vb). But, speaking of 'our habitable zone,' he says in one and the same column (M, 45rb) that the other temperate zone is uninhabited, yet accepts the existence of Antipodes, stating that there are inhabitants both above and below the equator, who 'hold their feet against ours,' as do those of India and Egypt. The two extreme zones (Arctic and Antarctic) contain qualities of the pains of the inferno, which are the cold that descends to the centre of the earth, presumably by subterranean passages (it will be recalled that in the *Divine Comedy* Satan is encased in ice at the earth's centre); while the middle zone contains the pains of heat, which is the inconsumptible and invisible fire of souls, as is evident in the earth's interior (M, 110vb).

But on the earth's surface the so-called *zona perhusta* is the land of those living in the flesh, or the land of true promise, where Arin is situated with many inhabitants who live for thirty-three and a half years (M, 45va), and concerning whom Michael quotes several biblical passages. There was located the paradise of delights, from which Adam and Eve were ejected; and the air in this *zona perhusta* is more temperate than in any other zone by reason of invisible celestial virtue.

> For this zone, which is called *perhusta*, by reason of globosity is higher than the earth in any part of the present orb, which is called *mundus*, and so is nearer the sky than any other part, and was not reached by the waters of the Flood (M, 45va).

In Scot's commentary on the *Sphere* of Sacrobosco the question is raised whether the earth is habitable at the equator. It is argued that it would be too hot, because it is between the two

tropics, which are both very hot. But against this it is held that the sun lingers longer above the tropics, while at the equator day and night are always equal. Aristotle is cited, both from *De proprietatibus elementorum* and from *De generatione* (T, 262).

If God and *celum celi* or empyrean heaven, also identified with the ninth sphere, if angels and demons, although spiritual beings, were regarded by Scot as within the ken of students of astronomy and astrology—and, to say nothing of the prologue to *Liber introductorius*, there are nine mentions of the empyrean heaven within sixteen later leaves of the Munich manuscript (fols.35ra–51ra)—still more were the terrestrial paradise, inferno and purgatory looked upon as parts of the universe and fit subjects of scientific inquiry. Was not the inferno at the centre of the earth, itself the lowest and vilest of the elements, and the farthest removed from the empyrean heaven, abode of God, angels, and souls of the blessed? In *Liber particularis* Scot depicts Frederick II as representing himself as not yet informed concerning paradise, purgatory, and inferno,

> and what difference is there between the souls which are daily borne hither and the spirits which fell from heaven? And does one soul know another in after life? And can any return to this life to speak or show himself to anyone? And what are the pains of hell? (H, 293, 127).

Already in *Liber introductorius* Scot had stated that the centre of the earth was the prison of damned spirits, and

> as far removed as possible from the heavens. And were it elsewhere than in the middle, it would be nearer to one side than to the other (M, 122vb).

Some say that as soon as the soul is separated from the body, it passes through fire and water and enters into a new body in another zone,

> remaining for a full age of a thousand years before it returns for a similar renovation (M, 45va).

In one manuscript of *Liber particularis* hell is said to be a dark place, but well defined, 'in the middle of the whole elemental earth which sustains us,' unlike purgatory, which is not well defined.

> And so it is said that souls which are to be saved are purged in many parts of this world and of the elements (Oc, 48ra).

The inferno is round like a furnace or oven (*clibanus*) and surrounded by rocks and mountains. It has only one entrance, from which branch out certain openings which give some notion of it, as in parts of Sicily, in India, and in the north. From these openings come forth flames and smoke and sulphurous odour, and voices are heard clamouring thus:

> Woe is me! Woe is me! Why did I do no good, and why did I not observe fully the law of my Lord? (Oc, 48ra).

In another manuscript we read that the inferno is so called because it is *infra partes* and holds all heavy things such as sinners and tormenting spirits (P, 150v).

> And as earth is in the midst of water and the heart of an animal in its breast, so the inferno is in the middle of the body of the earth.

This place is in every respect dissimilar and contrary to paradise.

> And just as in paradise is the heaven which is called the seat of God, so in inferno is the pit of the abyss, located in the fourth abyss. For there are seven abysses.

Elsewhere we are told that the four rivers which flow from paradise are of great virtue and supply gems and the best gold. Then in the top margin of the next page it is stated that the fire at the last judgment will go as deep into the earth as the waters of the deluge ascended above its surface (M, 45vb, 46ra).

In replying to Frederick II more directly, the further information is given that the souls of the damned are brought in by spirits of the air and are tormented by the fallen angels; and they are compared to loaves of bread in a furnace. Next to that heat is superfluous cold. There is only one entrance, well guarded by the bravest and most sagacious spirits, and there is no exit (Oc, 57va–58ra).

Michael believed further that demons could not endure the sound of harmony and fled from music, whether vocal or instrumental, or from the song of birds (M, 43ra; O, 57vb). He thought that the ninth sphere was silent as well as starless, but

that the eighth sphere of the fixed stars revolved melodiously 'with smoothest sound and sweetest voice,' because outside itself it had an essence (i.e. the ninth sphere) by which this sound was reflected (O, 40vb).

Scot's knowledge of geography, as of history, was more extensive than correct. He believed that the sons of Noah divided our habitable zone into three parts or continents of Europe, Asia, and Africa (P, 142r). In what, let us hope, is a passage perverted by copyists, the Chaldees are said to have sunrise when the sun is near its setting in the west, and the Athenians to have sunrise when 'we' have noon (M, 45va). For Scot, the Atlantic was the 'ocean sea' stretching westward to unknown limits, uncrossable by men because of its vast extent, and with no habitable land beyond it (Oc, 38vb). Gades was an island to the west in the neighbourhood of Africa, where Hercules had erected two tall columns, with an arch superimposed, 'to mark the site of navigation' (M, 34vb).

> He did likewise in upper Egypt, forsooth in the last part of India, next to an intransitory sea.

Many say that the Red Sea is forty *stades* or five miles higher than the great sea (meaning presumably the Mediterranean), which Scot takes as equivalent to saying that it is five miles deeper.

Of mountains Scot refers to Caucasus and Olympus (M, 45va, 49vb). The deluge covered the latter, but the lower part of the heavens is named Caucasus from the former. Scot alludes to Etna and other volcanoes of the island of Sicily, but his references to places on the Italian peninsula are more numerous and more familiar. He tells of one mountain which puts any would-be climber to sleep by its soft air and fragrant herbs (M, 52va).

In some level places the inhabitants are handsome, with clear colouring and shapely bodies, and in some quite the contrary is found (P, 153r; Oc, 41va). This is also true of mountainous places and valleys. Michael goes on to treat of places near mountains, of those near the sea, of the movable surface of the earth, and of the change in the quality of the air coming from the ascension of vapours.

In explaining the action of hot springs and volcanoes, par-

ticularly Montegrotto, Porretta, Bulicame, Etna, and the Lipari islands, Michael posits the existence underground of rocks of live sulphur and stones of a very hot nature, in the vicinity of many empty spaces, 'which we call veins and channels,' through which wind may blow or water flow. Among the objects thrown out by volcanoes is the pumice-stone used by scribes. If such hot stones were above earth and the sulphur with them, the world would have long since been consumed by hot winds and flames. But divine mercy, in constituting the world, located that sulphur and those stones within the earth, so that the flames there would not destroy the world or places near by, since 'on the said mountains are houses dwelt in by men and culture of earth, from which are had many fruits.'[1]

There are many parts of the world in which eggs are not put beneath hens, but carried by women in the bosom for some days until the eggs hatch (*pullificant*). There are also parts of the world where they hatch on the day they are laid. This is caused by the great heat of the sun, and so in those parts chicks multiply fast. That this is possible is argued by analogy from fleas, which generate the same day, if a new oxhide (*bufulus novus*) is filled with sand or other powder and pissed in and held closed to the sun (M, 117rb). On the same page in the first column we have been told that the right testicle generates males and the left females, not only in human beings but in all animals; that a boy born in a waning moon will have a white skin and yellow or white hair; that hen and goose eggs are larger in a waxing moon; that hens lay better in a waxing moon and south wind, worse in winter; that the more a hen is trampled on by the cock, the better she lays and rejoices to find many eggs together in the nest, and sits on them and hatches them the more quickly; and that the smaller a hen is, the more she cackles and lays, *ut patet in cancris et canellis* (M, 117ra)—which would seem something of a *non sequitur*.

The year is begun at different times and varies in length among different peoples: Hebrews and Jews, Egyptians and Arabs, Finns (?) and Cumans, Romans, Arcadians, inhabitants of Arcae, Iamni (?), and others (E, 112vb; M, 70vb–71ra).

[1] For the longer Latin text, H, 296–7. 'Montepulciano,' at pp. 292, 296, is corrected to 'Bulicame' (near Viterbo), in the 1927 edition, 'Additions and Corrections,' p. xv.

Trees, too, vary with localities: those that bear incense, dates and olives; cypress and pines. In some places *negarie*, *morarii* (sycamores?), and *escoli* (Italian oaks?); in some, figs and filberts; in some, willows and poplars; in some, chestnuts, elms, ash, and oak (M, 70vb).

Besides a more normal account of the tides, which agrees practically verbatim with one in the Munich manuscript,[1] the Escorial manuscript (72va–b) had earlier offered a more novel explanation, which it says that every naturalist ignores (*Et est alia causa grandis quam omnis naturalis nescit, et est sermo rectus*). 'Sea water is naturally assigned to the sun, and fresh water to the moon.' The sea keeps its place, as the sun keeps its position in the zodiac (*in signo vel in firmamento*), while fresh water wanders from place to place, as the moon hurries through the twelve signs. When the moon begins to influence sea water, since their natures are dissimilar, the sea is immediately disturbed, not desiring the moon's contact nor wishing to obey it, and so flows with great fury and clamour towards the shore.

If the cause is inquired, we say that it is the mixture of the cold influx of the moon with the influx of the heat of the sun, as is often felt by mariners and islanders.

Michael, if he be the author, goes on to say that he has made this bare statement not for lack of a fuller opinion which exists in philosophy, but in order to present a simpler doctrine for novices in astrology and for the greater convenience of students who are none too bright (*qui sunt grossi ingenii*).

In another passage Scot says that the tide is higher when the moon has just reached the northern line of the equinox, or of Aries and Libra, or the line of Cancer and Capricorn, which he calls *stiptialem*. He adds that the tides are discussed further in the chapter of *Liber particularis* which opens, '*Cum diutissime Fredericus imperator . . .*' But in MS Canon. Misc. 555 the tides are twice discussed at fols. 39ra and 44ra, before the Emperor is addressed at fol. 44va. In the former passage it is said that when the moon is in the east or the west the tide is high; when it is in the south or the north the tide is low. Because of this there are two high tides in the day and two at night. When the moon is in

[1] M, 65va–b; E, 112ra–b: opening, '*Concordia maris et lune tanta est et talis, quod sicut est motus unius, ita est motus alterius . . .*' and closing, '*. . . nec aliud est dicere estus quam accessus et recessus.*'

Aries in March and in Libra in September, there are exceptionally high tides. And when the moon is in Cancer in June and in Capricorn in December the tides are very high, although perhaps not so high as at the equinoxes. The tides are then also ascribed to

> the spirit of wind full of vigour, breathing as it were, as an animal breathing through its nostrils emits and remits force, and so does the sea because it ebbs and flows with the spirit of the wind.

In the latter passage, which may be contrasted with that in the Escorial manuscript, it is said that the tides do not follow the movement of the sun but that of the moon. The cause of this is that the sun is *significator* of everything hot and dry, such as fire and sulphur, while the moon is *significator* of everything which is cold and wet, like water, women, and fish. A long and somewhat confused passage then follows:

> As often as the moon is renewed in light, the sea begins to increase, and this goes on until it comes to the south, that is, to midsky or to the seventh sign with respect to the sign in which it first was.

Then it begins to decrease

> and just as the moon gradually grows in light from day to day until at its full, which is on the fourteenth or fifteenth day, so it gradually decreases.

The tides further vary according to the complexion of the sign in which the moon makes its stay.

> For example, let us say that the moon is now renewed in Aries, which begins to rule on 15 March, and then the tides begin to get very high, which goes on until it is in the seventh sign, and then gradually the tides begin to decrease until it is in the end of the twelve signs from its first beginning.

When the moon rises in an equinoctial sign, Aries or Libra, the tide is higher for the whole year (?)—month is probably meant. This is also true when its rising is in a stiptial sign, Cancer and Capricorn, but then the tides are less than when the moon is on the equinoctial line.

> Likewise the tides are higher when the moon is renewed in its own sign, as in Cancer which is its house, and in Taurus because it

rejoices in it, in Scorpio because it is of its similitude, in Aquarius and Pisces.

Moreover, there is high tide twice in the day and twice at night because of the circuit of the earth which the moon makes between day and night once by aspect of the signs of the zodiac, and that one by one from angle to angle and from sign to sign, as appears in this quadrangular figure.

In defining the word gulf (*sinus*) towards the close of a passage on the tides, Michael gives as examples the Ionic (Aegean?) in the west, Caspian (whose inland character was first clearly recognized among Latins by William of Rubruk, A.D. 1253–5), Indian, Persian, and Arabian (known otherwise as the Red Sea) (E, 112rb; M, 65vb).

Number appealed to Michael Scot as strongly as did names. When stating that the rainbow has two names, he adds that the sun has seven. Like music, number seemed to him of prime importance in the constitution and operation of the universe and all its parts. The eight notes of the scale reminded him of the eight parts of speech and the eight beatitudes (O, 53ra). He divided the six days of creation into two groups, spiritual and temporal, of three days each. There were ten orders of angels; one fell; the other nine divide into three hierarchies of three each.

Four things make a man wise: intelligence, diligence, experience, and memory (M, 16va). There are four elements, humours and qualities; four cardinal virtues, four points of the compass, four seasons of the year, four evangelists, four angles of the throne of God and of the firmament, and four principal parts of the human body: heart, brain, liver, and testicles (E, 35vb–36ra).

Seven is the number *par excellence*, with seven planets, seven firmaments, seven abysses, seven ages of the world and of man, seven degrees of relationship up and down in either sex, seven human actions of the five senses and sleep and waking, seven climes, days of the week, parts of the night (from Isidore), sacraments, orders of clergy, and gifts of the Holy Spirit. There are seven angels who are rectors of the planets, seven rectors of the seven metals, and seven senators of the seven firmaments whose names are Orphymel, Tyngra, Dapnael, Kalira, Asinor, Pasca, and Baal. The trivium and quadrivium of the seven liberal arts are associated as follows with the seven planets: grammar

with the moon, dialectic with Mercury, rhetoric with Venus, arithmetic with the sun, music with Mars, astronomy with Jupiter, and geometry with Saturn (M, 29va). There are seven human virtues, four of the body and three of the soul. There are seven cells in the womb.

Besides the twelve feathers in a bird's tail and twelve signs of the zodiac, there are twelve prerequisites for any art: what it is, of what material, genus, parts, what workers, what the office of the art and of its masters, what its purpose, utility, goal, instrument, why so called, and to what part of philosophy subordinated (E, 57ra; M, 16vb; O, 21va; P, 34vb–35ra). Scot lists twenty-eight kinds of divination in his prologue, and there are twenty-eight mansions of the moon. The statement that God made twenty-two creatures in the six days of creation seems derived from Isidore, *Etymologies* XVI, 26, 10, who in turn borrowed from Epiphanius, *Liber de ponderibus et mensuris*. Scot, however, lists eight creatures for the first day against Isidore's seven, the latter omitting fire of the four elements, while Isidore counts four on the third day against Scot's three; but they cover the same things. Both proceed to count twenty-two generations from Adam to Jacob, twenty-two books in the Old Testament, and twenty-two letters in the alphabet in which divine scripture is written. The ultimate significance of the number twenty-two would appear to rest upon its rough identity ($3\frac{1}{7}$ or $\frac{22}{7}$) with pi, the ratio of the circumference of circle to diameter.[1]

Hippocrates, who from nobility of genius deserved to be chief of all physicians, would comprehend all ages under the number seven. Johannitius, compiler of the art of physic, said that there were only four; others said five; yet others, six. Michael Scot sympathizes with their disagreement, but thinks that one should not go so far as to distinguish being weaned and cutting one's first teeth as initiating distinct ages (O, 119va); and that childhood is the primary age of humanity and basis of all subsequent ages. He goes on, however, to separate infancy from boyhood (from seven to fourteen years).

Turning to ages of the world, Michael adds to the six of the present world, which were not equal in length but so called

[1] This possibility is not recognized in Epiphanius' *Treatise on Weights and Measures. The Syriac Version*, edited by James Elmer Davis, with a Foreword by Martin Sprengling, The Oriental Institute of the University of Chicago, Studies in Ancient Oriental Civilization, No. 11, 1935, p. x, n. 24.

because something new occurred in each, a seventh of antichrist, and eighth of blessed resurrection in which the just shall ever live with Christ (O, 120va).

Michael applied the word age (*etas* or *aetas*) even to such short periods as the four quarters of the moon (M, 34va), which respectively signify childhood, young manhood (*iuventutem*), *senectutem* and *senium*. When the moon is in conjunction with the sun at the end of the month it signifies secrets and hidden things. When it emerges from the sun's rays on the first of the month it signifies all that is present and to be done immediately.

A moment is the briefest division of time, derived, according to Isidore (V.29.1), from the motion of the stars (*a motu siderum*). Scot adds four varieties:

> The first is while the eye of man winks once, and ten of these make one moment. The second is while a stone falls in a whirlpool of water, as long as it is seen after it enters the water. The third is while a bird in its flight flaps its wings once [*semel prutit alas*]. The fourth is during one revolution of a potter's wheel (Oc, 11ra; P, 136v).

The hour (*hora*) is treated from two different points of view: magical in *Liber introductorius* (O, 162rb; E, 115ra; M, 108rb–vb), Christian in *Liber particularis* (Oc, 4). The first hour of the day, when men pray to God, is a good time to bind all tongues by characters, images, and conjurations. The second hour, when angels pray to God, is a favourable time for constructing images and other devices to promote love and concord. The third hour, when birds and fish pray to God, is a good time to make images and other contrivances to catch birds and fish. Similarly a favourable time to invoke spirits is the first hour of the night, when the demons meet with their lord. In the second hour of the night fishes and reptiles sing psalms to their god, and it is a good time to catch them. In the fourth hour ghosts emerge and demons go abroad as winds or shadows or wearing the forms of animals, and it is the time for images, characters, and conjurations of hate and injury to another.[1] The Christian enumeration of hours represents Christ as arrested on Mount

[1] This passage is found anonymously in an MS at Florence: Laurent. Plut. 89 sup., cod. 34, fol. 174r–v. For earlier instances of this horary of the day and night, dating back perhaps to the apocryphal Penitence or Apocalypse of Adam, see M. R. James, *The Lost Apocrypha of the Old Testament*, 1920, pp. 2–3.

Olivet at dawn; as brought before the high priests, Ananias and Caiphas, in the first hour; before Pontius Pilate in the third; before Herod in the sixth; crucified in the ninth; and removed from the cross at vespers. Michael explains that the seven parts of night (twilight, vespers, *conticinium*,[1] *intempestum*, cockcrow, *matucinum*, and *diluculum*) are not hours; it may be they are called hours *'ab ydiotis'* (M, 52rb).

There are numerous verses dealing with *Computus* and the calendar. Egyptian days are noted (M, 68rb; O, 93va), the virtue of four days of the year (M, 69vb), and three days in the year on which a woman is never born nor conceived (E, 119ra).[2]

Just as medieval chronicles were apt to start from Adam protoplasm, so Scot tells us 'of the place in which the first man, that is, Adam, was created' and why he was so named (P, 57r–v; E, 15vb; O, 121r–v; M, 89rb), also why at birth a male child cries 'Oa' and a female 'Oe,' meaning, 'O, Adam (or O, Eve), why did you sin, so that I must suffer infinite misery on your account?' (*Phisionomia*, cap. ix). In one manuscript of *Liber particularis* man is said by his genius to surpass angels and demons, known and unknown (Oc, 52ra).

As might be expected from the translator of the works of Aristotle and Avicenna on animals, allusions to these, beginning with the creation of birds of the air and fish of the waters on the fifth day, and of terrestrial animals and man on the sixth day of creation, are not infrequent in *Liber introductorius*, although it is primarily intended for students of astronomy and astrology. Even before the account of creation we are told that while the elephant looks big, it knows nothing compared to a fox (E, 2rb). Or, in discussing the moon, it is added that the ant stays in its hill during the time of the full moon and the interlunar period (M, 86va). Less perhaps of a digression are the statements suggested by the sign Taurus, that the Gentiles sacrificed a bull to Jupiter, that its gall is helpful in *colliria*, and that its excrement staunches bleeding (M, 55va). Cremation of three live crabs is advised to protect shrubbery from storms, while Archibius is quoted as writing to King Antiochus of Syria that a red frog in

[1] Du Cange defines *conticinium* as *'nox intempestata cum cuncta silent,'* and *diluculum* as *'tempus matucinum,'* but does not list *intempestum* and *matucinum* separately.

[2] See also Cambridge, Gonville, and Caius 441 (636), 14th century, fols. 33v–36v, *Materia pro sermonibus de naturis rerum*, opening, *'Dicit Hippocrates in anno tres dies in quibus mulier numquam . . .'*

a new clay pot wards off tempests from crops and vineyards (M, 86vb; O, 117vb). Yet another method to protect 'your vineyard' from future storms is to consecrate a magpie among its vines.

Each of the four elements has an animal peculiar to itself: the mole to earth, *alec* to water, chameleon to air, and salamander to fire (E, 104va–b; M, 58rb; P, 54v–55r). Winds, which are invisible to human beings and to most animals, are seen by cows, cats, geese, cranes, and hens (M, 23rb). Sheep die from eating a sweet skin or scum produced in the pasture by the chill of the air, which generates choler and many worms and small flies and, spreading through the intestines, injures the internal organs (M, 24vb).

The tail of the scorpion, with which it stings, is mentioned in two passages which are twenty leaves apart (M, 36vb, 56va–b). In the former the two frigid zones 'of small size' are compared to the tail of the scorpion,

> which is so subtle, because in it reigns a lethal virus of frigid nature.

In the other longer passage the sign Scorpio is compared with the animal, which is black in colour and in its belly has a theriac which is an antidote for the poison in its tail. It blandishes with its claws the victim which it is about to sting with its tail, which it raises above its head. So its month, October, is warm at first but cold at its end. Another view is that the sign is called Scorpio because the animal lives off earth and gladly dwells in dirt and in obscure, filthy places such as the vicinity of latrines and rheumatic regions.

The loss of any one of the twelve tail feathers, which represent the signs of the zodiac, impedes a bird's flight. The phoenix is mentioned in *Liber particularis* (Oc, 51rb) as often roosting in a tree in India and giving responses to all comers on all themes and in all languages. *Liber particularis* concludes with chapters on herbs, trees, men, other animals, their limbs, birds, fish, and worms. The last includes those found in wool, flesh, and cheese. Mention is also made of an animal which ejects smoke through its nostrils, of others which kill by a mere glance or a single puncture, and others which contain both a poison and its theriac (P, 160v). Whether the cicada is a bird is disputed (P, 161r;

Oc, 53ra). The sweet odour of the panther is reported in one manuscript to carry one mile (P, 160r); in another, four (Oc, 52ra). The hoopoe is said to live merely on human dung (Oc, 53ra).

*Liber introductorius*, although it has been cited concerning trees, has less on vegetation than on animals. It states that aromatic drugs which have been reduced to powder retain their odour longer (E, 22rb; M, 9rb), and that the shade of some trees is wholesome, and of others not (E, 72ra–b; M, 30ra). On the first page of the long prologue, sycamores are said to be signs of a royal death or change of realm.

As for the mineral kingdom, iron filings with sugar or honey are said to generate a fine colour on the jaws of the face (M, 27rb). The virtues of gems, gold, stones, and metals are mentioned in *Liber particularis*. We have heard the influence of the planets compared to the action of the magnet in *Liber introductorius*, and *calamita* or the mariner's compass is twice mentioned in *Liber particularis* (Oc, 48v, 50r–v; P, 162r).[1] Coral, of whose animal origin Michael Scot was ignorant, was for him an amulet against storms, if buried in each corner and in the middle of the vineyard (M, 86vb). A passage on metals in *Liber particularis* will be discussed further in the chapter on alchemy. Electrum is defined as three parts gold and four parts silver (E, 12rb).[2]

[1] H, 294–5, note 130, gives the Latin of the first two passages, but does not mention P, 162r. The allusions of Alexander Neckam to the mariner's compass (Thorndike, *Magic and Experimental Science*, II, 190) are probably earlier than Michael's.

[2] The word, *electrum*, had been employed in the sense of enamel a century earlier by Theophilus, *On Divers Arts*: see the recent editions by C. R. Dodwell (Latin text and English translation) and by John G. Hawthorne and Cyril Stanley Smith (English translation only).

# VI · Meteorology

In this chapter are presented Scot's views on four subjects which fall within the scope of Aristotle's *Meteorologica*, although it is hardly cited by him in connection with them: namely, the seven regions of air from *Liber introductorius*, and passages on the weather, rainbow, and comets from *Liber particularis*. The relation of the signs of the zodiac to weather during the twelve months in *Liber introductorius* has already been illustrated by that of Scorpio to October.

## I

The seven regions of the air (E, 67va–71rb; M, 25va–27rb; O, 32vb–35rb),

> in which are humid impressions of diverse disposition which are aqueous humours from earth, raised on high by the attraction of heat,

are those of dew, snow, hail, rain, honey, laudanum, and manna, which

> through intervals of time are gradually transformed from region to region, and from the being of one into the being of another.

Dew falls from the lower parts of air near the earth's surface. Snow is nothing but subtle vapour raised in air, and crystal, quicksilver and iron are generated in the regions of perpetual snow. Hail is nothing but drops of water congealed by the dry winds and chill of the upper air. Dyers and those who make ink should use white wine or rain water. Honey drops from the air on to flowers and herbs, and is collected by bees; but Michael distinguishes this natural variety from the artificial, produced,

as he thinks, by the bee's digestive process.[1] He further explains that sugars (*de zuccaro et zaccara, saccarum et zathara*, and yet other spellings) are not liquors originating in vapour, as honey and manna are, but come from the pith of canes. One variety of sugar is white, solid, and temperate in its qualities. The other is a yellowish powder. It has the virtue of straining and dissolving and extenuating, of moistening the belly without irritating it, of softening asperity of breast and lungs, of restoring lost and essential humidity, of tempering acute fevers. Laudanum is a humour of the air in the east, and is never collected 'in our parts.' Manna falls with the dew, like honey and laudanum, and is found in India. The children of Israel in Moses' time were nourished on it for forty years, 'and lived as healthy as a fish in water.'

I do not know of any previous author in whom this discussion of seven regions of air occurs. It was essentially repeated by Thomas of Cantimpré, *De natura rerum*, Book XVI, whose work was professedly a compilation, but in which Michael is not mentioned, although elsewhere Thomas cites his translation of Aristotle's *History of Animals*. Here, however, he cites Aristotle's *Meteorologica*, which treats only of dew, snow, rain, and hail (honey being mentioned in quite other connections). Thomas explains that the other three are found mostly in the Orient, where the air is purer. It is furthermore a peculiar circumstance that many manuscripts of the work of Thomas open with this discussion of seven regions of air, which thereby becomes its first instead of sixteenth book. It would seem to have commanded attention. Vincent of Beauvais, in his *Speculum doctrinale*, had one chapter on 'Air and its Regions' (XVI, 42), in which he said, 'There are, moreover, seven regions of air, as the philosophers say,' but cited no one in particular, and a later chapter on the seven humours of air (XVI, 54), in which he referred back to the preceding chapter but again made no particular citation. The next chapter on dew and honey was,

[1] In the late-thirteenth-century herbal of Rufinus, fol. 69ra–b (see my edition of Chicago, 1945, p. 188), Dioscorides is quoted as describing honey as celestial dew collected by bees, but *Circa instans*, a twelfth-century treatise on simples, as stating that it is artificially composed by bees, who take the purer part of the flowers.

Shamash-rêsh-usur, governor of the lands of Sukhi and Muri on the middle Euphrates, boasted about 800 B.C. on his monument that he reintroduced 'bees which collect honey' into that region 'from the mountains,' adding, 'They collect honey and wax. The preparing of honey and wax I understand, and the gardeners understand it': L. W. King, *History of Babylon*, 1915, pp. 265–7.

however, marked 'From the book *De imagine mundi*,' while Chapter 56, '*De ladano et manna*,' was '*Ex libro de naturis rerum*.'

In both Michael and Thomas the text on the seven regions of air opens similarly:

| Michael (O, 32vb; M, 25va; E, 67va) | Thomas of Cantimpré, *De natura rerum* (Harvard Riant MS 19, 1r) |
|---|---|
| Regiones aeris sunt septem in quibus solent habundare impressiones diverse dispositionis que sunt aquosi humores terre in altum elevati per attractionem caloris ex sole . . . | Septem sunt regiones aeris ut dicunt phy(losophi) sub firmamento celi in quibus aquosi humores terre per attractionem caloris ex sole . . . |

After listing the seven, our manuscripts continue:

| | |
|---|---|
| He enim per intervalla temporum gradatim transformantur de regione in regionem et de esse unius in esse alterius . . . | gradatim de regione in regionem per intervalla temporum transformantur |

The paragraph, '*De regione roris*,' opens similarly in both *Liber introductorius* and *De natura rerum*; then diverges:

| | |
|---|---|
| Roris regio prima est (in) inferioribus partibus et ibi habet locum scilicet prope faciem terre. Nam ros ab aere descendit purissimus . . . | Roris regio prima est et hoc in inferioribus partibus aeris. Ros in aere venit quando aer generatus rigore noctis et lune splendore . . . |
| . . . et hoc est propter habundantiam sui humoris quid excepit desubter. | . . . pestem non sentit propter habundantiam humoris. |

The treatments of the region of snow differ from start to finish:

| | |
|---|---|
| Nivis regio secunda est nec aliud nix nisi vapor subtilis in aere elevata . . . | Nivis regio secunda est. Hanc ita diffinit philosophus. Nix, inquit, aquarum vapore . . . |
| . . . et ventos in Alemannia. In tarentano (?) ubi (?) nix perpetua regnat, concipitur cristallus et argentum vivum ac ferrum etc. | . . . refoventur et hoc quia calor naturalis in homine accidentali frigore reluctatur. |

There is likewise almost complete variation in the passages as to the regions of hail and of rain.

Thomas states more fully and specifically than Michael that honey is the substance of a humour in the air, which comes from the fumes of owers, herbs, and fruit, crosses a great space of air to above the region of the clouds by virtue of the sun, descends again on herbs, fruit, and flowers in an occult and most subtle manner mixed with dew, and produces a tempered taste in things. Like Michael, he distinguishes two varieties, natural and artificial, but adds that 'among us' the former falls only in June about the time of the summer solstice. Both state that, if eaten by them, it produces a pestilence in sheep and goats, but Thomas says nothing of cane sugar. He says that laudanum and manna are found in Greece as well as the Orient, and that both are adulterated to a great extent.

The name laudanum was applied by Paracelsus in the sixteenth century to one of his compound medicines, whence is derived its present use for alcoholic tincture of opium. In classical antiquity the term *ladanum* (Greek λήδανον) was used to describe a resin from a shrub obtained from the hair of goats feeding on or near it, as Pliny states in two places in his *Natural History* (XII, 37; XXVI, 30), and the herbalist, Rufinus (who now spelled the word *laudanum*), mentions more briefly in the late thirteenth century.[1] But Michael Scot seems the first to represent it as an aerial product.

In one of the manuscripts of Thomas's encyclopedia that open with the seven regions of air, the following account is given, *De regione lagdani*, as it is there spelled.[2]

> The sixth region is of *lagdanum*. *Lagdanum* is a humour of the air in the Orient and sometimes in parts of Greece, falling with the dew or in place of the dew. When it has fallen on the herbiage, the herbiage is divided by use of whips, thus that precious humidity is whipped together. When dried, it is called *lagdanum*. The reason why it does not fall among us in Europe is the same as we have stated for honey. Pure *lagdanum* and unmixed is aromatic and very precious. It is adulterated with goats' leavings [*cum digestione caprina*] and things of that sort which can be blackened and masticated. It is adulterated to such an extent that hardly an ounce is found in ten pounds. That should be selected which is heavy and

[1] Edited by Lynn Thorndike, 1945, pp. 165–6. Hermann Fischer, *Mittelalterliche Pflanzenkunde*, 1929, p. 265.

[2] Harvard University, Riant 19, fol. 2r.

black, and the more it can be chewed, the more aromatic it is. If it is light red and breaks in one's hands, this is a sign that it is consumed by age or is too adulterated. *Lagdanum* has stringent and heating force from being viscous and aromatic. It is good for catarrh from a cold, if snuffed up the nostrils. *Lagdanum* and roses are boiled in rain water, and when the water has tempered a little, the patient receives it in his mouth, and with that water the feet are washed to help the nerves. For loose teeth, *lagdanum* and mastix are compounded and put about the gums and teeth within and without, and loose teeth are tightened. It comforts the matrix and aids conception. Against stomach-ache caused by cold and to aid digestion, five pills of *lagdanum* are given in the evening.

Michael Scot's account of the region of laudanum was briefer:

The sixth region is of laudanum, noting that laudanum is a humour of the air in the Orient and is *sometimes* [reading *non numquam* for *numquam*] collected in parts of Greece. To be efficacious, it should fall with the dew on flowers and herbs. It is denser than manna and brown or black in colour. It should be understood that goats feeding in pasture collect it on their beards which touch the dew on flowers and herbs. When the third day has passed, the goatherds comb these beards and gather it gradually until they have enough. In Europe it is not had in good condition. Like honey, it is good for head colds and catarrh. The reason is that it is hot and dry in the first and second degree.[1]

But from such typically Scotian digression to sugar and laudanum we return to the field of meteorology proper.

## II

Michael Scot's attitude towards the weather may be illustrated by his chapter in *Liber particularis* on change of air caused by winds (P, 152v–153r; Oc, 41rb–va). The text varies considerably in these two manuscripts.

The air is temperate in some places and intemperate in others. It is temperate in a place which is subtle from vapours of delightful odour, in which our bodies neither sweat nor grow cold, and which will rapidly change to hot and to cold, as at sunrise and sunset, comforting the virtues, tempering the complexions of the body, purifying the humours, clarifying the spirits, and ameliorating the digestion in living bodies.

[1] The Latin text which I have translated is almost identical in E, 71rb and M, 27rb.

Intemperate air in its whole substance is like epidemic air, which happens in two ways: one from mixture[1] of vapours which corrupt the air breathed in, affected by reservoirs adjacent to cities or from corpses of dead beasts or on occasion of battles that give rise to dangerous diseases.

Or from change of air from the seasons of the year, such as a winter which was hot and dry, that is, not rainy, and summer contrariwise, that is, cold and wet. And if in its quality it shall be hotter or colder than an even temperament, this happens in five ways. First, by reason of the time of year. Second, from the rising and setting of the great stars by their distance from or nearness to the sun, as Alabor and the bear's tail. Third by reason of the winds,[2] for the north wind prolongs life and adorns men's bodies. The south wind does the opposite, and the like in the case of women, whence the south wind is good for women. And all this is apparent in winter by men being improved and women deteriorated, and the opposite in summer. Similarly the east wind is temperate to man, but the west wind is variable like autumn.

Fourth, by reason of regions which are divided in five ways: first, by reason of the four cardinal winds. Second, from the site of cities or[3] lands or places, since air and water are the cause of efficacy of creatures which are conceived, whence in some flat places there are beautiful peoples of clear colour and fair form, and in others quite the contrary is found. So too it is in mountainous places and in valleys. And the same is true of beasts and herbs and plants and health and sickness, for example, Alamania, Sclavonia, Formilium (?), Lombardy, Tuscany, Provence, France, Scotland, etc. Third, from the vicinity of mountains, since some regions have mountains interposed and obstructing the south winds, like the inhabitants of northern regions. Fourth, from the vicinity of the sea. For when a region is between mountains and sea, it should be judged thus. If the sea was to the south of the region, the region is said to be southern, and it is to be similarly understood of other parts of the world. Fifth, from the mobile surface of the land. For land naturally rocky is cold and dry, and its water is colder than the water of muddy land . . .

Sixth, from change in the quality of the air coming from the rise of vapours and not in its substance, as I said concerning epidemic air. And it is possible that a region be of two natures or three, which will alter dispositions, figures and seasons according to themselves.

[1] In Oc the rest of the sentence reads: 'of bad vapours by which it is privily corrupted, coming from lakes, fishponds, and the rotting of dead bodies, as from a battlefield and from cemetery burials made in an ark or hut.'

[2] Oc omits up to 'Fourth . . .'

[3] Oc continues: 'or other place, since air and water are the cause of some new departure. That this is true is evident, since in one place there are births, and the men are handsome and the women foul, and elsewhere it is the contrary. It is the same with beasts (?); for example, the people of Alamania in stature are unlike the peoples of Romaniola and the March of Ancona.'

## III

Michael Scot's account of the rainbow has at least the merits of brevity and clarity, and of being readable and comprehensible, compared to those by some of his contemporaries, although far from being either correct or complete. Albertus Magnus took some eleven chapters (*Meteor.* III, iv, 6–8, 11–12, 21–26) to say somewhat the same in more sporadic fashion. Albertus cites Alfred of England, but not Michael Scot, until, in the last chapter on the opinion of Avicenna and Algazel and Nicolaus the Peripatetic concerning the rainbow, he remarks in conclusion that foul things are found in the book called *Questions of Nicolaus the Peripatetic*, but of which he thinks that the real author was Michael Scot

> who, to tell the truth, neither knew nature nor well understood the books of Aristotle. So this for the present is said of the rainbow.

But almost the only point on which Albertus actually disagrees with Scot's account of the rainbow is that Michael says that one cannot be seen at night oftener than twice in fifty years (what Aristotle actually said was that he himself had seen one only twice in fifty years), whereas Albertus asserts that truthful experimenters have seen one twice in the same year. Roger Bacon, who attributed the rainbow solely to reflection and not to refraction, also held that it had been proved by definite experiments that a lunar rainbow could be seen oftener than twice in fifty years and ascribed the false statement in the existing text of Aristotle to the error of the translators.

Since Michael Scot is not even mentioned in the most recent and authoritative history of accounts of the bow in past writers, by Carl B. Boyer,[1] I give a partial translation of Michael's account (Oc, 28va–30rb) for what it may be worth.

> The arc of the sky, which is formed naturally in the clouds of air and not in pure air, is wont to appear principally at two seasons of the year, spring and autumn, and is usually formed oftener in autumn

[1] *The Rainbow: from Myth to Mathematics*, 1959. It treats, however, of William of Conches and Alfred of Sareshel, Thomas of Cantimpré and Bartholomaeus Anglicus.

than in spring. At other times of the year it does not appear so often. Indeed, in summer it rarely appears, in winter never. It is generated by moonlight at night as well as by sunlight in daytime. It is true that the bow is generated from both sunlight and moonlight when those two bodies are in one and the same hemisphere. But that bow which is generated from sunlight only does not appear except in the daytime, and that which is generated by moonlight (28vb) does not appear except at night. It is true that a bow is more rarely generated from moonlight than from sunlight, nor can a bow be seen at night oftener than twice in fifty years. The reason is its concealment by too many clouds near the earth and also too great obscurity of the air, and, while we are not between the moon and elevated clouds, we cannot see it. So if we want to see a bow, we should be on the swelling of earth between sun and clouds, and then the sun is low and the clouds high, or conversely.

The bow is made by rays of sun or moon in three parts of the world, namely, in the upper hemisphere, that is, in east, west, and north. The bow is made in the east when sun or moon is in the west. It is made in the west, when sun or moon is in the east. It is made in the north when either is in the south. But a bow is never generated nor appears in the south, because the sun is never in the north above earth.

It is further said of the arc of the sky that it never appears to us unless we are substantially in a position between the sun and the clouds opposite it, collected in one from the adverse direction. So when the sun in summer is directly overhead or nearly so, we cannot see the bow, assuming that it is generated, because the sun generates it too far from us.

For this bow of which we are speaking is formed by the image of the sun in this way in the clouds of the air. For the clouds on which the bow, of whatever colour, is to be impressed, ought (29ra) to be rare and still, and low towards the earth, and so that the globe of the earth is higher than the clouds which receive the form of the rainbow. They ought also to be even and smooth, and from their stillness parts of the same ray flush the broad and light drops of water with brightness. Since they are alike, and little or almost no rain comes from them, the drops of water are then broad and gross because they fall from clouds close to the earth. Their outer surface should be level and not uneven, mountainous, valleyed, hilly, rather almost polished, light and still and rare, one part withdrawn a bit more than another. Thus the upper is able to receive the impression of the sun's rays, which appears in those lower clouds by such a form of colours in the round. And that sunshine reflects in such vapour, just as a luminous body reflects an image like itself from a mirror into the eyes of any onlooker. Because when the sun imprints or invades its radiance in a mirror or other translucid body, it by such impression stands in the way of the vision of eyes observing nor does it let itself be seen without serious injury to the eyes. For you see the rays of the sun in water, and the sun from which it comes is in

the opposite direction. Likewise the rainbow, and such an arc is formed by the rays of the sun. But the sun for you is in the opposite direction. For you have the rays of the sun and the bow before your eyes, but the sun behind your back.

Finally it is said concerning the formation of the arc of the sky (29rb) that it is generated from rays of the uncovered sun, which, when they fall materially on a cloud opposite, are reflected in vapour already gathered opposite them in those lower clouds, and turn themselves to that upper cloud which receives the impression. Whence there is a vacuity between those clouds, and the air there is pure in the middle of them. And it happens to such cloudiness as to the water of a river or spring or brook, on which the sun's rays strike and are reflected through the air invisibly, if there is much distance of air. But if the expanse of air is small because of the vicinity of a house or wall or smoke from a house, the rays are reflected invisibly to the house or wall and appear on it visibly enough. So it is through crystal, through glass, etc.

Or let us say the bow is produced in another way, but really the same. For while the sun shines back in rarefying clouds, that is, rare and opposite, and, breaking through the nebulous humour, impresses its rays on thin clouds far away, which are, however, still, even and smooth, a repercussion of its splendour is made in those clouds, and chiefly in the lower of the low, rare, even and still, from which by the gleam of the radiant sun a bow of the aforesaid sort is formed. It does not always appear, but only when the clouds in the air are thin among themselves, as I have said, and not far raised from the earth.

And while the sun is materially round, there is an image formed in the clouds of the sky, and that image is called Iris. Yet the sun itself is considerably higher than the clouds in which it impresses the form of a bow, and the clouds are not higher than the sun, and the sun exactly touches (29va) the upper part of the said clouds, by which touch it imprints the modal form of a wheel circumduct by four superficial lines. This form is called a bow. It should be understood that the nearer the sun is to rising or setting, so much larger a bow is formed in the opposite direction. For the aforesaid impression is called a bow, but perversely, since it never shows the heads of its horns, nor has in full the form of a bow. Rather it is the image of the sun impressed on the aforesaid clouds after the fashion of four lines drawn around with a compass.

The arc of the sky naturally has four colours which it gets from all four elements, which sometimes are perfect and absolute in species, and sometimes mixed in a certain variety which in the art of painting is called adumbration. So the arc of the sky consists of four colours, of which the first is red or wine-coloured, and this is drawn from fire. The second is entirely white or yellowish, and this is drawn from air. The third is purple or blue, and it is drawn from water. The fourth is green or oily, with something of black, and this is drawn from earth. For these colours of the iris are either pure

or compounds of themselves, so that that which is drawn pure from fire is red in appearance, and so with the others, or it is part red and part yellowish or white, and so it will be composite in appearance. These variations occur according to the varied disposition of the clouds, which receive such impression from the sun's rays, wherefore a fiery cloud makes a red colour; a thin one of little substance, white; a *zalla* cloud, purple or blue and black or quasi-green or black like oil. For this impression of the air is made in a round and humped form like a circle so that red colour comes first on the outside, and white or yellowish (29vb) is next to red in the concavity of the hump of red colour, and so with the others subsequently, and this whether pure or composite.

When this bow appears in the sky, it has various significations for us. Risen in the east or to the right or left or about the east, it signifies the quick approach of fair weather. Risen in the west whether from right or left or about the west, it signifies that thunder will come and light rain, not much, with broad drops. Risen towards south or north, it is a sign of much rain from that direction. If it does not come, this is by reason of some star or wind. For in that direction is great abundance of waters.

It is called arc of the sky from its likeness to a bended bow (*arcuati arcus*). Its own name is *yris, yridis*, and it is called *yris* as of the air (*aeris*) because it descends through the air to the earth, whence the verse:

> *Yris res mirra, tamen non est*
> *yris in terra.*

After some further text, largely repetitious, or religious concerning the just wrath of God and sinners, Michael makes the following surprising assertion:

> It should also be known that four bows, and maybe more, can be formed at once,[1] at slight distance apart. And when so many are formed, people seeing them are much astounded, and then it is a sign of a small gathering of clouds in air, and those which are there are for the most part rare and subtle in substance. And that is a sign of very little or no rain, and they do not produce thunder but break into fragments and vanish. And such clouds appear very *zalla* and low and mountainous (*montuose*). Black and thick clouds do not generate so many bows, also produce thunder and rain . . .

Scot's account seems based in part on earlier medieval writers in Latin, such as Isidore of Seville of the seventh century and William of Conches of the twelfth, although neither is cited by

[1] Boyer, *op. cit.*, p. 271: 'the quaternary rainbow arc has not been known to appear in nature.'

him in this connection. The brief tract in which Scot's younger contemporary, Robert Grosseteste (died 1253), ascribed the rainbow to refraction is not utilized by Michael and perhaps appeared only after his death in 1235.[1] Although he speaks of drops of water, he does not emphasize the individual raindrops (*guttellae*) as Albertus did tentatively (*Meteor.* II, iv, 12, *Qualiter guttellae rorantis nubis sunt specula solis*), and Theodoric of Freiberg was to do conclusively at the beginning of the fourteenth century. On the other hand Michael, like Theodoric, recognized four rather than three colours of the rainbow: red, white or yellowish, purple or blue, black or quasi-green, as against Theodoric's red, yellow, green, and purple.

## IV

Comets are twice discussed in *Liber particularis* (Oc, 21rb, 23rb; P, 58v). In the first passage it is said that a comet is a tailed star, and that it is called *cometes* because it pours forth hairs (*comam*) of scintillating light from itself in different directions. This star, when it is born or appears above the face of the earth, indicates sudden political change or great wars or famine or barrenness of earth, seditions everywhere and general afflictions such as abscesses or inflammations, sudden death, or other tribulations of pestilence. All these and more come rather after its setting and disappearance than at its rising. But if it appeared in the east, they will come quickly; if in the west, tardily. Prudentius, Lucan, and Virgil are cited, and it is stated that every planet except the sun and moon is at some time a comet.

Two leaves later in the Oxford, but not in the Paris, manuscript, we are told that there are many opinions as to comets. Our manuscript notes that stars with hairs (*comas*) are not in the sphere of the fixed stars but much nearer to us, and may be any of the planets except sun and moon, which are never tailed.

> But the light of those stars is continued with the light of the upper dogstar, so that it becomes oblong, and that is seen in their scintillations as hair (*coma*). Nor is such scintillation made except by the revolution of that body of the planet which rules and dominates in that part, and that which appears of flame or smoke is only from the composition of vapours elevated by the excess of heat united in them.

[1] Boyer, *op. cit.*, pp. 89–95, etc.

Thus the former passage at first calls a comet a star but ends by identifying it with one of the five planets, while the second passage opens by denying that comets are in the sphere of the fixed stars and identifies them with the five planets, and ends by a close approach to the opinion of Aristotle that they are terrestrial exhalations but raised and dominated by one of the planets. On the whole, however, Scot seems to have favoured the opinion against which Aristotle argued in *Meteorologica*, i.e. that a comet is one of the planets.

# VII · Medicine

Scot's own writings and other external evidence indicate that he possessed considerable medical knowledge, and had perhaps received a medical degree and practised that art. Tiraqueau, in the long chapter on physicians in his *De nobilitate* of 1556, includes

> Michael by cognomen and medicus by profession, by nation a Scot, *apud Balaeum, centuria 3,*

and adds that Pico della Mirandola, Symphorien Champier, and Cornelius Agrippa also mention him. De Renzi, *Collectio Salernitana*, I (1852), 292, says that Arnaldo di Napoli in his *Breviarium practicae* frequently cites Michael Scot. But this was not noticeable in the work of that title by Arnald of Villanova in the 1504 *editio princeps* of his *Opera*.

J. Wood Brown (p. 154) noted one Latin manuscript which was a collection of recipes primarily from 'the book of Michael Scot, physician to the Emperor Frederick,' but also 'from the works of other doctors.' However, it ended: '*Finis urinarum magistri Michaelis Scoti*' (Vatican, Reg. Suev. 1159, p. 149). Two Italian versions of Michael Scot on uroscopy are extant in manuscripts of the fifteenth century at Florence and Naples, and a third, which Brown did not mention, at Perugia (316, 15th century, fols. 91–106). In one Latin manuscript of the *Physiognomy* a discussion of uroscopy intervenes between what is usually its second and third parts (Oc, 77vb–80ra), '*De noticia pronosticationis urine tam sanorum quam egrorum et neutrorum,*' opening '*Urine condicio multiplex est . . .*' Although elsewhere Michael closely associates other animals with man, he holds here that uroscopy applies only to human beings. He further distinguishes the urine of a woman, and of a virgin and pregnant woman.

In October 1220, when Michael Scot was residing in Bologna,

he appended to his translation of Aristotle on animals the following note, which has been preserved in two manuscripts, both of the thirteenth century, the one in the library of Gonville and Caius College (109) at Cambridge, the other in the Convento S. Caterina (11) at Pisa:

> In the name of our Lord, Jesus Christ, completed is the translation of the book of animals. And I, Michael Scot, who gave this book to the Latin-speaking world[1] swear that in the year 1221, Wednesday, 21 October [21 October 1220 by our calendar], I was approached by the most noble lady of the whole city of Bologna, who was my hostess and was very discreet and noble and lettered above other women in her city, namely the wife and widow of Albertus Gallus, and she introduced to me a discreet and sage woman, Maria by name, who had a noble domicile in that neighbourhood.
>
> And Maria showed me two stones that looked like eggs, and one had a shell like an egg. And on one of its two sides it had a hollow and on the other a hump. And on the front part which projected forward there was more whiteness, and on the hind part more blackness. And throughout the entire substance of that first stone, which was like an egg, was a circumvolution of web, shell-like and hard, and the exterior cortex was black, yet subtle like an egg-shell. And all the other shell spirals in the same stone were most tenuous and very distinct and turned to powder when cut off, and signs of veins and nerves appeared in them, imperfectly however, and so it was to the bottom of that stone in the middle. The stone was very light for its size. And between all its follicules it worked by way of veins and nerves, and in the paths of veins and nerves more white appeared in the incision, and the surface of the stone responded to incision with iron and within the exterior cortex like an egg-shell. And the interior follicules were like the flour of powdered chalk.
>
> And that stone came out of the womb of the aforesaid Maria on the first of July, and a week later out came the other stone of the same sort and the same weight for its size, because it was a little smaller. Also it was darker and depressed on both sides.
>
> And it seemed to the aforesaid Maria for eight years before the emission of those stones that she was always pregnant, and sometimes her belly swelled and sometimes the swelling went down.
>
> In the aforesaid stones nothing sandy was found, as in the stone of intestines and bladder, and between red streaks (*telas rubeas*) were signs of white skin.
>
> When it was investigated why this had gone on for so long, the aforesaid Maria told me that it was to avoid the pain of urinating.

[1] This characteristic phrase of Michael, *qui dedi hunc librum latinitati*, we have already heard him employ twice in the dedication of Averroes' commentary on *De celo et mundo* to Stephen of Provins.

The passage shows Michael's knowledge of anatomy, his ability to dissect, and his power of close observation.

Michael's medical reputation is further attested by pills attributed to him in a thirteenth-century manuscript now in the British Museum (Additional 24068, fol. 97), where they are praised as good for all diseases and of indescribable goodness. Their constituents[1] are three drams of the best *aloe epaticum*, one dram each of brionia, *mirobolani* of India, *rebri* (?), *bellirici*, *enblici*, *citrini*, *mastix*, *dyagrida*, *azar(in)i*, roses, rhubarb,

> and compound them with juice of cabbage (?) or absinth. Let the dose be seven or five.

A very good oil against worms (*oleum optimum ad lumbricos*) is ascribed to Michael Scot in a Vatican manuscript (Latin 4440, 15th century, fol. 71va).

Not definitely attributed to Michael Scot, but of much the same order are:

> Pills of the glorious king of Sicily, which Pope Alexander took every day (Salins 45, 15–16th century, fol. lxiii, verso).

The king and pope in question would hardly be as early as Roger II of Sicily, who died in 1154, and Alexander III (1159–81). Still less would the pope be Alexander V, whose pontificate lasted less than a year (26 June 1409 to 3 May 1410), and who therefore would not be much of an advertisement for the pills. But Manfred as King of Sicily was contemporary with Alexander IV, pope from 1254 to 1261, of which he spent the last years at Viterbo and died there, and who might have taken pills that went back to Michael Scot and Frederic II as King of Sicily.

In *Liber introductorius* it is said that there are as many medicines as there are infirmities, and that this holds true of three things—words, herbs, and stones, whose virtues we see operate daily, as in the sacred host of the altar, the magnet and its use by deep-sea navigators; and in plasters, powders, and confections. Men should live for 140 years, since there are fourteen knots in the fingers and toes, and each joint represents ten years. But

[1] For the names which follow consult the Index of Herbs to my *The Herbal of Rufinus*, 1945.

because of sin the maximum life span is reduced to 120 years. Every physician should know the four human virtues, and the ten modes of cognition in each disease according to Hippocrates (M, 115rb–va; O, 173rb–va).

Early in the first *Distinctio* of *Liber introductorius* it is said that the physician must know the state of the moon and wind, and somewhat later, in the margin of one manuscript, that he should know the nature of the moon, and that one should beware of night air (M, 35ra). Again, the closing leaves of the second *Distinctio* are largely occupied with the moon: its mansions, influence on the bodies of animals, the effect of sleeping or sitting long in moonlight, and that the influence of the moon, new or old, is very apparent in human qualities—on tears of the eyes, headaches, scab and skin disease, rheum between flesh and skin, drops or gout (*guttae*) in bones and marrow, menstrua of women, milk of the breasts, tortion of the belly, solution of the body, constriction of the breast, pain of the sides and womb, rheum of the eyes, flux in the nose, deafness in the ears, itching of the flesh, inflation of the veins, pustules, fevers, and catarrh.

> Also the infirmities of the sick who lie in their beds grow worse, and thus health is retarded in many, although they are given medicine. These things which we have said in the present chapter are secrets of nature and very useful in the art of astronomy. Therefore every astrologer should take note of them, and they will profit him some day, if God so wills (O, 178ra).

In the third *Distinctio* of *Liber introductorius* on astrological interrogations, questions are asked as to the sick, whether a death was natural, the favourable time for blood-letting and purging, or for the physician to begin to treat his patient, whether one will remain healthy or sick this year. The following is one specimen:

> When you are asked by someone as to a sick person, whether he will escape from or die of his present illness, look at the ascendent and where its lord is, since both signify the patient and his condition. Also examine the moon for the patient, because it is a witness of the fortune of this sick man concerning whom the interrogation is made. Afterwards see the tenth house and its lord, since by them are signified health and medicine, or the virtue of the medicines and the advice of the physician. Then look at the sixth house and its lord, by whom the illness is denoted. Then see the eighth and its lord, by whom death for the sick is noted. Then see the fourth house and

its lord, by whom the end for each of the aforesaid things is truly indicated.

For if the lord of the ascendent is well disposed in the ascendent or the tenth or eleventh, it signifies escape of the patient, that is, finding the lord thus is a sign that he will be freed from this infirmity, and that there is no danger of death. And if the lord of the ascendent is not in the ascendent but is in the eleventh or tenth house, and, conversely, the lord of the eleventh or tenth is in the ascendent, it is in every way a sign that the patient will be cured. And if the moon is in the ascendent or eleventh or tenth. . . . And if fortune is in the eleventh or tenth or fifth, it is a sign that the medicines are good and full of virtue and so will help to restore him to his pristine health. And the more quickly, if fortune is in the tenth.

But if the lord of the ascendent is in six or seven, it signifies a long siege of the illness, and that the physician is of little help. And if the lord of nine is retrograde, the physician errs in not knowing precisely the degree of the infirmity, or he errs in his *consilium* and so harms the patient latently. But if it is direct, the physician conducts himself well in both these respects.

And if the lord of the ascendent is in the seventh house, it indicates that the patient is not following the advice of the physician as he should and has been instructed to do, or someone of the patient's household is at fault.

And if the lord of the ascendent is in the eighth house, or the lord of the eighth is in the ascendent, it signifies death. And if the lord of the ascendent is in the twelfth house, it signifies death, mourning and burial, or that this illness cannot be cured by this physician. And if the lord of the fourth house is in the sixth or seventh or eighth or twelfth, and conversely, it signifies all evil concerning the patient and not concerning the physician.

And if the first sign is mobile, it signifies that all pertaining to it will happen quickly; but if fixed, slowly. And if common, indifferently as to the aforesaid, or a change of infirmity.

Further note that, if evil was in the ascendent or with the lord of the ascendent, it signifies gravity and impediment of the state of life of the patient, and conversely as to fortune.

In the foregoing passage the word *consilium* is used twice in the sense of advice to a particular patient or account of a particular case. The idea or practice goes back to Syriac and Arabic versions of Galen, if not to Galen himself: see Hunain ibn Ishaq's list of 129 Galenic treatises known in the ninth century, as reproduced by Max Meyerhof in *Isis* 8 (1928), 696, No. 73, '*Pro puero epileptico Consilium.*' Its introduction in western Latin medicine has sometimes been ascribed to Taddeo Alderotti of Florence, later in the thirteenth century, but it is here seen to go back at least to Michael Scot, early in that century.

In the passage which has been quoted earlier as to the effect of change in pasture upon sheep and horses, Scot goes on to say that rustics cannot stand town life, while delicate or invalid townsmen (*cives*) are rapidly cured if they change to the food and drink of some mountainous village. In this case, however, for some reason which is not understood, many of them eventually die either from a long illness or suddenly. A certain Bolognese, who was fat and healthy, left his native city for a swampy site in Venice. Within a month he became pale, thin, and weak, and felt so sick that he had himself carried back to Bologna. As soon as he had passed Ferrara he began to feel better, and in eight days was quite well again. 'And so for a thousand examples' (O, 40va).

Scot asserts in general that women live longer than men, and in particular that a man mated with a woman delightful for beauty and youth dies sooner than she and sickens more swiftly. 'The like holds true of every animal' (M, 29ra).

While discussing why the water of springs is cold in summer (M, 29va; P, 53r–v), Michael engages in a digression as to the regimen to follow in hot weather, when the blood, especially of males, coagulates.

> And they die suddenly, as is evident every year, but more so in one year than another, as when Mars and Jupiter are with the sun in the same sign, Leo (E, 71vb).

It is beneficial to drink fresh and cold water often, and to take *messium rosatum* with cold water. Also hands, feet, belly, breast, and head should be washed often with cold water,

> so that the pores, opened by its frigidity, may close up, and the natural heat be conserved within.

One is further advised to stand in the shade and north wind; to eat little, favouring milk and cold food, and abstaining from all food which is hot and dry—as, for example, peppered and curried food—or too stiptic, like the whites of hard-boiled eggs, flesh of an animal's heart, and old wine. This advice applies more to one person than to another, to youths more than the aged, to men rather than women, to the choleric more than the sanguine.

Surroundings and work should also be observed assiduously (E, 72ra). It is healthy for some to stay after tierce till vespers have passed in a shady, or otherwise cool and damp, place, as in a darkened room, where sunshine does not penetrate, as close to the ground and in caverns and near a channel of flowing water, and not in a solarium. Air should enter from the north and not otherwise, with doors and windows closed to other directions. For the aged this is not so beneficial. A young man should keep off roads that are too sunny, particularly those with white walls. Especial care should be taken not to let the rays of the sun heat one's uncovered head. This is because they occultly extract the natural heat from the blood of the veins, as is shown by a fire burning in the sunlight. If the splendour of the sun is too great, it mortifies the fire by its virtue and does not let it burn, as is seen every day in the flames of the wax tapers which are carried at funerals.

Advice is added as to the shade of what trees to sleep under. Males are warned against sexual intercourse and blood-letting in hot weather, except in an illness where phlebotomy is absolutely necessary. But sexual intercourse at that time is beneficial to females—more so than phlebotomy.

In cases of grief, melancholy, deceit, or other difficulty, where medicine fails, the physician should advise the patient to go to diviners and enchantresses, although this may seem wrong (*inhonestum et nephas*), or contrary to the Christian faith, but true nevertheless (O, 175va–b). When the influence of the moon diminishes the force of medicines, the physician should see this and fortify them (P, 46v). Scot also treats of the four humours of the human body (P, 106r, 107r, 111r).

As there are nine heavens with one centre, so the human body has nine openings: two eyes, two nostrils, two ears, '*virga viri et vulva mulieris atque anus*' (M, 15rb).

# VIII · Sociology

Michael Scot presents a picture of society as well as of the universe. He is concerned not only with the world of nature in the broadest sense from creation till now, and from the empyrean heaven and angels to the inferno and demons, but also with human affairs, from the discussion of human nature in general in the *Prohemium* of *Liber introductorius* to vivid particular passages on varied aspects of political, economic, and social life.

Thus he not merely compares the movement of the planets against that of the heavens to that of ants on the rim of a wheel and birds in the air, but in another place (P, 75v) says that the planets are not in their spheres as men are in their houses, but rather resemble men and women dancing and disporting beneath an awning which is hung high in the streets on a holiday, when people enjoy themselves in many ways. Or, speaking of the vicissitudes of fortune (P, 12ra), Scot says that one person is born of a poor woman and perhaps in a hovel (*tigurio*), and remains in poverty through boyhood, but afterwards begins gradually to prosper until he becomes rich in science or attains some dignity of honour. On the other hand, another is born of a noble lady in a rich palace, yet in a short time meets with adversity, so that he comes to the last quarter (*quadrantem*) and, living like a beggar (*hostiatim*) and wanderer, ends his life wretchedly in the streets or a hospital. A third goes to dig a ditch or plough a bit of earth, and finds gold or silver, or a vase full of balsam, or a potent powder to make gold. A fourth, with pure soul and good intent, goes on a pilgrimage to Rome or the Holy Sepulchre, but drowns[1] or is killed by robbers on the way.

Scot states that the method of divination of Alchandrinus is in general observed among the Arabs and by some Hindus, as one may see in the streets and alleys of Messina and *Tonisti* (Tunis?),

[1] As Frederick Barbarossa had done on the Third Crusade.

where there are wise women who invite new merchants to inquire as to their condition, their house, and the success of their business. Or he alludes to the practice of necromancy and the invocation of demons 'in the arched habitation' (arena) at Verona (O, 22va), or the alley along the wall at Naples (M, 17vb). He mentions sulphur baths in the vicinity of Viterbo and Padua (Oc, 57ra). In one manuscript of *Liber particularis*, Germans are said to be unlike in stature to the inhabitants of Romaniola and the March of Ancona (Oc, 41v). Crete, Malvasia, Cyprus, and Damascus are listed together as in the same zone, characterized by fair weather, and by odoriferous and potent wine (M, 46ra). The great differences between men living in different regions of the world 'in figure, in speech, in constitution, in customs and action, in time of peace and war, in time of health and sickness' are evident between Lombards and Slavs, Germans and Greeks, Tartars, Saracens, Scots, Jews and Egyptians (M, 70vb–71ra). Medieval anti-Semitism is reflected in the statement that Jews emit blood *per virgam* every lunar month, because they told Pontius Pilate that 'His blood be upon our heads' (M, 34va; E, 79rb).

The questions put to astrologers which Michael Scot tells how to answer include those concerning the sick and absent, whether one will get out of prison quickly, whether the message will be delivered, who will win the lawsuit, questions as to fear, for a judge, whether a statement is true or false, and on war between two places. A number concern theft: will the stolen object or its equivalent be recovered? where is it located? is the thief domestic or an outsider? Should a member of a religious order remain in it? What art or craft should a boy or girl learn, and when and where begin it? On what day and hour of the day it is good to take lodgings, or to rent a house to live in, or to change one's house or room or city; the favourable time for entering a bath, for cutting one's nails, shaving, or having a hair-cut, for sowing a field or garden or planting a vineyard. Further, whether to buy with the intention of reselling, when to marry, whether the mother of one's intended will be more favourable than the father, as to journeys and business trips and messengers; when to propose marriage; whether such a woman loves such a man; will one have offspring from one's wife or mistress?; whether a woman will be made pregnant by this man, be he her

husband or lover; whether it be good to take this serving man or this serving maid to stay with one or not, whether for price or for love; whether the father will die before the son. Further as to peace or war, gaining offices in state or church, clothing and gifts, food abundant or scarce, fertility or crop failure, getting rich from beasts, to buy one or not, and whether this year there will be mortality of beasts. What day is favourable? Will the new-born boy or girl turn out well? What sign and planet was he or she born under? And finally, there is a discussion concerning hidden treasure.

A man born under Saturn is represented as naturally inclined to a heavy, vulgar, or infamous occupation, or a very fatiguing one,

> and which always pertains to poverty and keeps him in poverty, and makes him unhappy or unfortunate, sad, moody and miserable, such as tilling the soil and cultivating it in every way,

digging, chopping, ploughing, sowing, planting, cutting the boughs from trees, gathering herbs and selling them in bundles, felling trees, sawing timber into planks, digging ditches and graves, carrying out night soil, emptying a well that has filled up with dirt and cleaning the bottom of a well and fountains, collecting stones and sand from the bed of a river and building levees, making cement to serve for new walls, carrying mortar (*rudhenam*) and bricks, bearing grain in sacks, raising bundles of wood overhead and handing them to another, reaping grain in the field, mowing hay in the meadow, tending gardens, carrying coal in baskets to the furnace, lifting wine in an urn, or bundles of iron or tin rods, or carrying them away. He is also likely to remove mire from street or road, to take manure from the stall, to clean latrines, to bury the corpses of those condemned to be hanged, to announce the orders of *podestà* or judge as common crier; to work hard for small pay, like packing hauberks in a barrel, striking iron in the forge,

> making anchors and axes, crowbars, ploughshares, mattocks, bending brooches and balances, turning *perascides*, etc. of wood and stone.

To turn a grindstone, sharpening some iron instrument, to make pots and earthenware, tiles, bricks, *fufaroli*, to make chains,

fetters, keys, stamps, mallets, chandeliers, tongues of bells, cutting stone, etc.

If at some time by good luck he has some gift of prosperity for his honour and consolation, and prelacy and domination over others, he fails to recognize it gracefully as he should and so conducts himself badly in such matters, and for the most part in all things which have to be done rationally. What good is given him by others is lost, so that it is said that the man born under Saturn is the worst, unless he be saved by grace. And if he seems good and honest, it is discounted as hypocrisy (M, 100va; E, 86vb; P, 104r, seems a condensation of M).

One born under the planet Jupiter is fond of fine clothes and colours, delicate food and drink, and wishes to live in peace and truth with his fellow men. He likewise delights in some light, honourable, peaceful, renowned, and very advantageous occupation, such as teaching the science of letters, grammar, physics, law, astronomy, and nature; sitting *ad theloneum* and there changing money; selling drapery of good quality and beautiful colours; carrying on business in honourable merchandise such as wax, cotton, gold, silver, embroidery (*frixios*), silk, gems and necklaces, noble vases and silver spoons, pitchers and boxes of crystal, girdles, purses, brushes, cloth of gold, tapestry, and cauldrons of varied cut. He may execute needlework for such things as altar cloths and the covers of children's cradles; to be judge, advocate, notary in the office of the commune, chaplain of a prelate, master *in cathedra*, *milex* of the local *podestà*, captain of the castle, and ruler of many, like abbot and prior. He may hear laws, orate, joust, go fowling, play chess, enjoy fine furniture, gardens, music, mills, flocks, and have household pets such as cats, monkeys, birds in cages, falcons, peacocks (M, 101rb).

A person born under Mars inclines to a dangerous, or heavy and fatiguing, occupation, low and of low pay, such as standing in the sun all day looking after a herd, guarding vineyards and highways against robbers, or a city or castle by night. He may turn out to be an assassin or homicide, or a cook for weddings, or work in a monastery. He may bake bricks and tiles in a furnace, compound mortar or cement, or liquefy metals in a furnace, strike coins and rods (*rami vel otoni*), brooches and balances of metal, or manufacture weapons.

Those born under the sun rather closely resemble those under Jupiter in sitting *ad theloneum* (*coloneum*, E, 91ra) and other respects, but are further inclined *elevare pulledios* (to raise colts?), often to tell stories, to frequent the streets, squares, and parks, and to ride.

Those under Venus also engage in some light and often fallacious occupation, vain, of little profit and much movement, such as making decoration for ladies' faces, unguents, plasters, dyes, rose water, and musical instruments such as reed-pipe and psaltery. They like to learn songs and sing them, to make wreaths of flowers to wear or sell or give away, to smell odoriferous herbs, *facere ypothecariam*, to stand and hear instrumental or vocal music, to make ribbons, headbands, embroidery, nets (*bindas*, *cavellos*, *frixia*, *retia*), to do needlework, making purses, girdles, cord-rope, *digitalia*, chasubles, *caveas coctas elicorum* (?), and to sew women's gloves, make covers for mirrors (*specula componere in copercul.*), to make dice to play *ad azurum* (the sky's the limit?), *facere fortunam pilicariam*, and to go fowling.

> Also he enjoys delicate living without much labour, if it can be had, as in the case of a servant of some lord or lady, not wanting to work and for the sake of eating and drinking better, to embrace, kiss, and cohabit, telling stories often, dancing, light thoughts, sadness refuted, and playing the games of boys and girls, or idling (M, 103rb).

Leaving out passages on mercurial persons, which have already been noted in the second chapter on Michael's early life and education, we come to those born beneath the moon.

A lunar person tends to mediocrity in occupation, as that of a sailor, runner, letter carrier, common crier, courtier, jester, weaver, gardener, shepherd, guard of city or castle, servant of lord or lady, ruffian, prostitute if she be female, petty salesman or peddlar (*vendriculus*), fisherman, wanderer from one house to another. He may sew chasubles and underwear, that is, shirts and drawers, wash linen, sweep house and street, draw water to sell, steal garden fruit, indulge in vain glory and so be pleased, if praised for beauty or probity (M, 104va).

With this passage may be compared that in the earlier Parisian manuscript (86v):

As for Luna, from the first day of his nativity all through his life, he is poor and weak. And if riches come to him, they do not last long, and he gets little pleasure from them. He is shiftless, idle, variable, now wanting this and now that, nor can he long remain stable in place and work. Greedy in everything, morose, mendacious, often false, and hasty in business, changeable in every way, credulous, more stupid than wise, sometimes thin and sometimes fat, tall rather than short, he always serves another willingly.

# IX · Psychology and Physiognomy

The two chief discussions of the human soul by Michael Scot occur in the two briefer manuscript versions of *Liber introductorious*. The fuller treatment, of almost a dozen leaves (36va–47ra), is found early in the Escorial manuscript; the briefer, contained in barely one leaf (108v–109v), comes late in the text of the Parisian manuscript. It consists of a series of *obiter dicta*, of which the first, 'Man knows by heart,' is still preserved in the expression, learning (or, memorizing) a passage by heart. The text continues:

> loves in the liver, speaks and breathes by the lungs, is angry in the gall, laughs with the spleen, imagines by the brain in the head.

It is further said that the soul joined to the body is nourished by cold and dry humour, lives naturally by humid and hot. Of its three virtues, the first orders, discerns, and composes; the second moves by voluntary motion because of freedom of the will; the third

> is sensibility. Also it is said that the soul is a substance participating in reason and accommodated to rule the body. The soul is lighted by wisdom . . .

And so on. In treating of human nature in the *Prohemium*, Scot referred to a chapter on the soul in the fourth distinction. Later in the text he cited a similar chapter 'in the last distinction of this first book.' The above-quoted brief passage does not fit these cross-references any too well, and the fourth distinction does not seem to be extant in other than fragments.

Dreams are discussed by Michael in the course of his treatise on physiognomy, and will be noted under it.

The long discussion of the human soul in the Escorial manuscript opens with two paragraphs on the relation of soul and

body, then affirms that 'the soul is the perfection of all organic body,' next asks whether it is from one and the same source as the body or from another source, and whether it existed before the body, and finally affirms that it exists 'by the sole will of the Supreme Creator,' and is not subject to the stars as the body is. Reason is discussed, and Solomon is quoted:

> Three things are difficult for me and the fourth I utterly ignore: the way of the eagle in the air, the path of the snake over the rocks, the course of a ship in the midst of the sea, and the way of a man in his adolescence.

Consideration of the soul recently separated from the body leads on to angels and demons. Then we come back to the three species of soul: vegetable, sensitive, and rational; and to the virtues of the last. The five senses end with touch at fol. 49ra, after which we return yet again to the rational soul, and 'revert to the first proposition of art in general and that of astronomy in particular'—phraseology which reminds one of that contained in the *Prohemium* at this point—only after some twenty leaves, in the course of which we have been told that

> The Athenians said, The soul is of all bodies the one eternal, by whose presence all bodies live and have being (45ra),

and that the Stoics called it the divine substance through which all things in the world exist.

Found in another context in more than one manuscript is the following passage, which seems favourable to the Averroistic doctrine of the unity of the intellect, condemned by the Church as contrary to the belief in individual immortality.

> God created all, corporal or spiritual, and rested from all His works. Hence neither souls nor stars are made anew more [in number] (E, 73ra).

In *Liber introductorius* we are told that the astrologer who knows well these judgments, namely, of the signs *in persona* and of the planets in the signs, can easily know the conditions of persons and judge their physiognomy. It was, therefore, quite logical for Michael to follow *Liber introductorius* and *Liber particularis* with a third book on physiognomy. It is found in

manuscripts of the thirteenth century, as well as in a number of others, none of which varies much from the printed editions, of which there are a score dating from before the close of the fifteenth century[1] and a number thereafter. It is sometimes entitled *De secretis naturae*. It opens with an introduction to Frederick II, and the following definition of physiognomy:

> For a certain sage says: *Physionomia* is the science of nature by whose insinuation one sufficiently skilled in it recognizes the differences of animals, and the vices and virtues of persons of all sorts (Oc, 60ra).

Its hundred-odd chapters, which vary in number in different manuscripts and printed editions (I shall use the numbering of the 1740 edition), are divided between three parts, of which the first deals with the process of human generation. After duly stressing the influence of the stars, Chapter 1 gives lists of foods to augment the semen, to diminish it without emission, to induce luxury, and to conserve chastity. Subsequent chapters treat of the time for sexual intercourse, how much is healthy, occasion for generating and not generating, and the relation of menstruum to the moon. The signs, physical, mental, and moral, of a woman of hot nature, who engages readily in sexual intercourse, are noted, and those of one of cold nature, who does not. Constantinus Africanus advises that a woman with too small a womb, *quae cognoscitur forma pedum, non coeat*, lest, having become pregnant, she die in delivery. But since there are some women, as well as men, whose health depends upon frequent intercourse, Michael advises *quod omnino coeant licite*, or carry with them a jasper or topaz.

In Chapter 7 women are urged to note the time of conception, in order to make the astrologer's judgment at birth easier. Scot further states that a woman can bear seven children at one delivery, and that the one from the middle cell of the seven in the matrix will be a hermaphrodite. But in Chapter 8 freedom of the will is affirmed, for God bestows a new and free soul upon the new-born body, to do whatever it wills of good or evil. If it is asked why an infant does not speak and walk as soon as it is born, since the soul is already perfect in the body,

[1] See my 'A Problem as to Incunabula of the *Phisionomia* of Michael Scot,' *Bibliographical Society of America, Papers*, 48 (1954), 411–13.

we reply that there are two causes: one, original sin; the other, the fault of the body (cap. 9).

The number of months after conception in which the child may be born is argued, and it is remarked rather irrelevantly that many sorceries can be worked by use of menstruum, sperm, hairs of the head, and by blood or footprints. Chapter 12 deals with things which injure or help the embryo and the pregnant woman; Chapter 13 with aids to mother's milk. Chapter 14 states that the blood of dogs, and of infants two months old or less, in a bath of hot water, undoubtedly cures leprosy.

Various questions are also put, such as why parents love a son more than he does them, and why a brother is not enamoured of his beautiful and delectable sister. The answer in the first case is that the son is flesh and blood of his parents, but not the converse; to the second, that, although the sister is the same flesh and blood, touching one's own hand does not arouse lust.

Three chapters are devoted to signs, almost all physical, of pregnancy in woman, and of conception in both sexes. Chapter 18, to tell whether a woman is pregnant with male or female, after advising inspection of her milk, gives 'this experiment in chiromancy.' She should be asked to hold out her hand. If she extends the right hand, it signifies a male child; if the left, female. Chapter 19 poses the question of how to tell from the first birth how many children a woman should have; Chapter 20, how to know if the embryo is healthy or diseased, and whether it will live or die. Therewith the chapters on human generation come to an end.

Chapter 21 is on animals *in genere et in specie*. Chapter 22 is a sort of classification and differentiation of animals, with such statements as: that every animal with more than four legs is bloodless; that every animal which lays eggs, sleeps little; and that every flying animal with hooked claws and beak lives by rapine.

With Chapters 23 and 24 begins the second part, 'reverting to the doctrine of physiognomy' (Oc, 71ra). It is, however, at first largely medical, treating of such signs as those of a temperate and healthy body, or repletion of bad humours and excess of blood, cholera, phlegm and melancholy in particular.

PLATE I *The sun drawen by four horses named after the four seasons*

PLATE 2 *The moon drawn by two oxen*

> Temperate and healthy bodies eat well and drink as agrees with them; digest and dispose of things, and taste well, and fast at convenient hours; rejoice with those who rejoice, sleep and dream well, feel or think easily; move lightly, perspire readily, rarely or never sneeze; are moderately fat, in face are coloured, in touch hot. In them the five senses flourish according to the requirements of age, body, and month, time, and hour (Oc, 72vb).

Turning to particular parts of the body:

> If the complexion of the heart is hot, the pulse is fast, the chest somewhat hairy beyond the age of adolescence, the flesh warm, appetite good, bold in action, sharp in words, in giving tenacious, obstinate, proud, irascible, and often lustful (cap. 34; Oc, 73rb–va).

> If the liver is of humid complexion, the blood is turbid, the body fat, the belly easily swollen, flesh soft to the touch, face pallid (Oc, 73vb)

Occasionally there is a medical generalization:

> Nature does nothing in vain and in every case does what is best, and so there is no idle quality in any body. It should be understood that man from his birth to old age does not cease to dry up, being born only to die (Oc, 75ra).

A number of chapters follow on dreams and their significance. Some are true; some false. Some signify as to the past; some as to the present; some as to the future. Some signify nothing but fancy. The age and food of the dreamer and the stage of the moon should be taken into account. A boy sees dreams in one way; a young man otherwise; an old man, still differently; and a woman, yet otherwise. A dream before food is digested signifies nothing or concerns the past. A dream while digestion is going on, but is not yet completed, signifies as to present affairs. A dream after complete digestion signifies wholly concerning the future. One is advised to arise immediately and make a note of a dream which seems of great significance, or not to sleep longer on the side on which one dreamt,

> and then he will recall it, when day comes, unless he saw many dreams (Oc, 75rb).

If he has forgotten part of the dream he should rub the back of his head, where the virtue of memory is located. Subsequent

chapters are concerned with dreams signifying the dominance of each of the four humours, each of the four qualities—hot, cold, dry, and moist—repletion of humours, and bad humours.

Next come single chapters (57, 58; Oc, 76ra–77va) on auguries and sneezes. Although auguries are forbidden by canon law, some are generally accepted, as on meeting a man or other animal, or hearing a voice. And this sort of augur is he or she who by such a science indicates future events, and by the singular signs of this science knows how to judge in general. There are some notable events which are properly considered auguries, as sneezing when kissing, meeting a flock of birds, the song of birds, hearing a voice, or an antecedent dream concerning a proposed affair. Among animals considered in the book of auguries are the eagle, *cornicula*, *nocticorax*, crow, owl, magpie, cat, dog, pig, and horse. Some auguries occur behind, some to right or left, and are named accordingly. They are twelve in number according to the signs of the zodiac: *fer noua*, *fer vetus*, *confre*, *emponent*, *scassarus nova*, *scassarus vetus* on the right side, and on the left *confer vetus*, *confer noua*, *viaraz*, *arenaz*, *scumassaris vetus et scumassaar noua*, each of which he describes, and all of which apply to moves or pauses of man or bird.

From the chapter on sneezing a few examples may be noted. If, while engaged in buying, selling, or some intellectual pursuit, a man sneezes twice or four times, or someone else does, and he immediately rises (if sitting) and proceeds at once to complete or continue the affair, he will prosper in it. If one sneezes twice in the night for three successive nights, it is a sign that some male or female of the house will die, or other damage befall, or, conversely, the greatest gain. If, after a recent agreement, a man sneezes once, it is a sign that everything in the agreement will stand firm; but if he sneezes thrice, the pact will not be observed. If a male patient sneezes once in bed, it is a sign of death; if twice, he will live. But the opposite is true in the case of a pregnant woman.

The third part of the work deals with parts of the body, from hairs of the head to soles of the feet. Of eight kinds of forehead noted, that which is high and round denotes a man who is liberal to friends and acquaintances, good-humoured, of good intellect, tractable to another, and virtuous with many graces. An unwrinkled forehead of full skin and bone denotes a man easily

litigious, vain, false, more simple than wise. Full breathing indicates a man of much spirit; defective breathing is due to small lungs or ailing throat. Of six varieties of shoulder blades, thin and minute ones signify a man who is weak, timid, and pacific; who works little, and is soon credulous and convertible to all. Fat knees indicate one who is timid, liberal, vain, and lazy; thin knees, one who is brave, bold, hard-working, secretive, and a good traveller. The concluding chapter, however, warns not to judge a man by one member or organ alone, since another part of his body may contradict its indications, but to tend always to a general judgment based on the majority of all his members. Also there are many other things to be taken into consideration, such as a person's age, long residence in one place, long social usage, excessive prevalence of the humours of his complexion beyond what is customary, accidental sickness, violence, accidents contrary to nature, and a defect of one of the five natural senses.

Foerster, *De Aristotelis quae feruntur physiognomonicis recensendis* (Kiel 1882), showed that several scattered passages in Scot's *Physiognomy* corresponded to ones in the *Secreta secretorum*, ascribed to Aristotle and translated into Latin by Philip of Tripoli. But this does not prove, as Brown held (p. 37),

> that it is beyond question that the Latin version of the *Secreta* was one of the sources from which Scot drew,

since Michael, himself a translator of long standing from the Arabic, could have made direct use of the Arabic text, of which the medical portion had been translated into Latin by John of Seville in the early twelfth century. Other evidence makes it more likely that Philip knew of Michael's *Physiognomy* and that his translation of *Secreta secretorum* was subsequent to it.

A. H. Querfeld, *Michael Scottus und seine Schrift De secretis naturae* (Leipzig diss. 1919), p. 49, noted that part one of Scot's *Physiognomy* dealt with the same matters as *De secretis mulierum*, attributed to Albertus Magnus, but regarded the later work as clearer in its anatomy and arrangement, and more independent in its use of sources.[1]

[1] On *De secretis mulierum* see my 'Further Consideration of the *Experimenta*, *Speculum astronomiae*, and *De secretis mulierum* ascribed to Albertus Magnus,' *Speculum*, XXX (1955), 413–43, especially p. 427 *et seq.*

# X · Astrology

In the brief Prohemium which opens *Liber particularis*, the final sentence states that he who is fully acquainted with these two books, i.e. *Introductorius* and *Particularis*, and knows how to operate, will obtain the name of a *new* astrologer. *Liber particularis* itself, however, contains little on astrology in the narrow sense of prediction of human future, since it is chiefly concerned with three matters: divisions of time, meteorology in the Aristotelian sense, and answers to questions put by Frederick II.

In the later leaves of the longer Prohemium to *Liber introductorius* we find Michael discussing knowledge of the future, the art of astronomy (or astrology), and the difficulty in answering astrological interrogations. Astronomy is not for a poor man (M, 15vb). Astrology is useful to physicians, kings, and barons, to merchants concerning journeys and sales, to mariners concerning weather and sea, and to alchemists, necromancers, and operators of the *ars notoria* for obtaining science suddenly (M, 16ra). After reaffirming his belief in God and in Christianity, Scot censures superstitious astronomy but accepts *ymaginaria astronomia* concerning things not plain to the eye but to the intellect, such as mathematical lines and spirits in the air. Like Roger Bacon later, Scot distinguishes between *mathesis* or knowledge, and *matesis*, which indicated divining; and between mathematics, which may be taught freely and publicly, and *matematica*, which is forbidden, not because it is false, 'since every art is true,' but because it is employed for evil ends (M, 117rb; P, 36ra). Scot further emphasizes the great importance of the astrolabe (M, 19rb, 119rb–121rb).

Elsewhere in the text (M, 107va), however, Scot states that there are two ways of knowing the length of an hour in any month of the year without the use of either astrolabe or quadrant.

One is by computus, the other by measuring the shadow of a man standing barefooted and bareheaded.

> Every astrologer is worthy of praise and honour, because he has found favour with God, his Maker, since by such a doctrine as is astronomy he probably knows many secrets of God, and things which few know (M, 118va; O, 178v).

He should have a house from which he can observe the hour or the sun and so on, with a secret room for interrogations. But he need not answer everybody nor every question. In the same passage, which opens the *Tertia distinctio*, Michael had just affirmed freedom of the will. The astrologer should keep up with the books in his art and study hard, but furthermore should be bold in exercising it, employing his imagination and reason as well as memory (M, 120rb; O, 1r).

The prologue concludes with an account 'of the invention of this art,' beginning with Noah and his sons and their descendants. Cham or Ham, who was naturally of most subtle genius, was learned in the schools of the demons and, as a prudent investigator, tested by experience what the demons had taught him and wrote it down on two columns. This he taught to his son Canaan, who soon outstripped his father and wrote thirty volumes on the arts of divination and taught his son Nemroth or Nimrod. When Canaan was slain in war, and his books were burned, Nemroth revived the art of astronomy from memory, and was, like his father, deemed by many to be a god because of his great lore. He wrote it out for his disciple, Ionicon, whose son Abraham also became an adept and came from Africa to Jerusalem, and taught Demetrius and Alexander of Alexandria. The last-named instructed Ptolemy, King of Egypt, who was more learned and talented than all his predecessors, and invented canons and tables, astrolabe and quadrant. The art was brought from Egypt to Spain by Athalax or Atlas, before Moses received the tables of the ten commandments. Atlas would seem to have been very long-lived, since we are next told how he showed the astrolabe to two clerics of France. A picture is then promised and shown of this giant, Athalax, naked, with the heavens on his head. Beneath the picture it is stated that at the same time Master Gilbertus (by whom Gerbert seems meant) was the best necromancer (*optimus nigromanticus*) in France, whom the

demons of the air readily obeyed in all that he required of them by day and night, because of the great sacrifices he offered them, prayers and fastings, since he had books about this and rings and *candaria* in great variety. Later he reformed and became bishop of Ravenna and pope (Silvester II). He borrowed the astrolabe, conjured the demons and made them explain it fully to him, and wrote down: (1) how it was made; (2) what it was good for; and (3) how anyone should work it. He also made the demons teach him all astronomy. Afterwards the astrolabe came into the hands of many, and consequently there were many doctors of this art of various nations, regions, and times who compiled books based on experiments.

Throughout the first *Distinctio* of *Liber introductorius* the moon is a subject of frequent consideration: what it has to signify, its marvellous and varying effects, to be wary of certain phases of it, the shadow in it, that it prefigures the world and human fortune, its motion, that it was created in Libra, *saltus lune*, its eclipse and canon, observance of it in cutting wood and killing pigs, its influence on the tides and phlebotomy, its course through the zodiac. Women having sexual intercourse under a waxing moon, especially when it is in a mobile sign and one like itself, conceive more quickly, and conceive males sooner than females, as well as on account of the reigning wind:

> and their delivery is easy then and less painful. The shells of birds' eggs are whiter, and the white is larger and the yolk smaller (M, 29ra).

Again, in closing the second *Distinctio*, the influence of the moon, be it new or old, upon the qualities of men is emphasized. When it is in a fiery or aerial sign of the zodiac, human beings of whatever age and both sexes are hotter, livelier, *laximores* (looser?), lighter, more vigorous.

> Scholars in the university learn better; doctors teach more truly, and all artisans work more efficiently (M, 118ra).

Scot adds a personal reminiscence:

> We used to say to our lord, the Emperor Frederick: 'Lord Emperor, if you want clear counsel from a wise man, ask him while the moon is waxing and is furthermore in a human sign, fiery or aerial. Let

the sage be fasting, of a pacific spirit, quite free from affairs, and not a man of two hearts' (M, 118ra–b; O, 177vb).

The importance of the signs of the zodiac is further illustrated in building a place or founding a city (M, 53vb). If built under a mobile sign, it will not last long; if under a fixed sign, it will long persevere; if under a common sign, it will soon be destroyed, but perhaps rebuilt.

The second *Distinctio* of *Liber introductorius* in both of the longer manuscripts is largely occupied with details of astrological technique: *puthei*—which are not to be confused with the constellation Putheus, of which we shall speak presently—triplicities, *fortitudines*, conjunctions, aspects, and exaltations of the planets, illustrated by a number of graphic tables and circular charts, a sign-man, and so forth. The planets are distinguished as strong and weak, equal and unequal, heavy and light, truthful and false in answering interrogations, pious or impious or halfway between piety and impiety, good or evil, fortunate and unfortunate. These points and their friendships or enmities are illustrated by further graphic tables.

In the briefer Paris manuscript such matters are summarized in a single sentence:

> To be inspected are the houses of the zodiac and the signs of the houses and the planets in these, in aspect, triplicity, exaltation, joy (*gaudio*), terminus, *facies*, own house and so-called, course swift and slow, station, fortitude, weakness, liberality, impediment, erection, setting, ascension, retrogradation, combustion, separation and reception, among which erection, conjunction and setting take first place (P, 99r).

In the two longer manuscripts the use of such terms had already been anticipated in the first *Distinctio* in such passages as the following (M, 55rb):

> Since the sign of the Ram is in heaven the natural house of Mars and the exaltation of the sun, and first in order of the other [houses], if Mars ever enters it, it signifies diverse impediments and injuries to come in the world, unless it has stronger contradictors by aspects, etc., (55va) when it induces subtlety in the air, heat in earth, strong and hot winds, whence, just as it dries the air, so affecting the bodies of men in which the dominance of red choler generates tertian fevers . . .

and furthermore wars, combustion, sedition, and so on.

Later on it is remarked early in the third *Distinctio* that a wise astrologer ought to note houses and signs, their *facies*, and the degrees of the latter

> through the whole rotundity of the sphere, and the fortitudes of the planets in the same degrees, or house, exaltation, triplicity, *terminus*, *facies* and conjunction of ray and body (M, 119rb).

He ought also to have in mind the virtue of the ponderous or superior planets as distinct from the light or inferior.

> Wise Archandrinus knew all these things, when he wrote his Book of Fortune, making mention of the three *facies* of the signs and the planets ruling in them (O, 179vb).

By *termini* was meant the division, quite unequal and disorderly, of the thirty degrees of each sign of the zodiac between the five planets other than sun and moon. Thus the first six degrees of Aries are assigned to Jupiter; Venus rules the next six; then Mercury eight, and Mars and Saturn five each. But in the case of the last sign, Pisces, Venus controls the first twelve degrees; Jupiter, the next four; Mercury, only three; Mars, eight; and Saturn, two. With such irregularity in numbers and order, it is remarkable that the table for all twelve signs in our Parisian manuscript (P, 76v) is identical with that for the 'Egyptian' system,

> without doubt that of Nechepso and Petosiris, the only one known to Dorotheus of Sidon, Firmicus and Paul of Alexandria, and which was law for all the representatives of classical astrology.[1]

*Facies* are divisions of the signs of the zodiac into three equal parts of ten degrees each, and so roughly correspond to the ancient Egyptian decans. Again the table of them in our Parisian manuscript (P, 78v), with Mars, the sun, and Venus for Aries; Mercury, the moon, and Saturn for Taurus; Jupiter, Mars, and the sun for Gemini, and so on, corresponds to that for the planetary decans in Bouché-Leclercq.[2]

[1] A. Bouché-Leclercq, *L'astrologie grecque*, 1899, p. 207. However, it differs greatly from his table for the Ptolemaic system at p. 211.

[2] *Facies* is not found in his Index, but at p. 216, note 2, we read: '*Mot traduit ordinairement par* facies (*cf. Martian. Cap., II, 200*) *et finalement réservé aux décans planétaires* (*ci-après, p. 228*).

Of the four chief sub-divisions of astrology—nativities, revolutions and conjunctions, interrogations, and elections—interrogations is the only one considered at length in *Liber introductorius*. But it offers much incidental reference to nativities, stating what sort of person is born under each planet, sign of the zodiac, and other constellations. This is apt to be based upon argument from analogy. Thus we are told that he who knows well the natures and properties of such animals as the ram and bull will know how to interpret the fate of one born under it. For example, Aries has wool and horns, *ergo* the wool signifies wealth and the horns, pride.

> Also Aries commonly expects death from bloodshed or iron, as by the butcher (M, 52rb).

Later on, the pictures of the signs of the zodiac and other constellations are accompanied by a statement in the margin, describing the person born under each. It is in the same hand as the body of the text, but may not have been so in the original, from which our two longer manuscripts are derived. In any case the statements are brief and limited to generalities, aside from the use of unfamiliar particular terms, as one or two instances will show.

For the constellation, Draco:

> One born under it will be an evil person, such as invidious, seducer, a litigant, quarrelsome, scornful (*dedignosus*), a sower of tares [*seminator cicanie*—whence our chicane?], a vagabond and pauper (M, 80rb).

For the constellation, Cassiopeia:

> One born under that sign will be handsome, luxurious, rich, of comfortable life, but ending in an evil death, as in an *auratura* or other *occasione* (uprising) made against him (M, 81r).[1]

For the constellation, Galaxia:

> One born in this sign will always be sick, wretched, poor, and in the desolation of peoples, wherefore he will spend his life in hospital and *hostiatim*[2] will seek his food, and will be unfortunate, etc. (M. 83va).

[1] *Auratura* is not in Du Cange, where definitions for *occasio* include *damnatio, mulcta, lis injuste intentata*, and danger.
[2] That is, will beg his food from door to door (*ostiatim*).

A more detailed discussion of one born under Leo and in July is actually found under Aries (M, 55rb), three columns before Leo is reached. The day of birth and the degree of the sign then ruling are to be noted, and judgment rendered 'according to their proportion.' If it was on the first day of Leo,

> the one born is of noble heart, that is magnanimous, seeking great and noble things like a lion, and strong, bold, warlike, often victor over his enemies, swift in action, he will obtain some dignity or office of honour before he dies, and will become rich, with vehement desire for noble things and full stability.

If he is born beneath the heart of Leo, prosperity is still promised him in every respect.

> But if below the tail, he will be wandering, unstable, like the lion's tail, rising to special prosperities and quickly falling from them.

He well knows how to arrange affairs with another, as the lion obliterates its tracks from the hunter with its tail,

> and just as the lion by vigour of genius or fortitude lives, reigns, intromits, perfects or fails, often in a fever, so it happens to a man born under him.

A single paragraph is devoted to nativities according to the day of the week on which one is born, or from two to three lines of text to each weekday (M, 110rb).

Sometimes an interrogation is concerned with a nativity, as when it is asked whether the infant boy or girl will learn an art or not, what path of virtue or vice he or she will in the main follow, or under what sign and planet he was born (P, 86r).

There are two methods of determining the individual's fate (M, 111va; P, 89r–v). The first begins by determining the ascendent. Once it is found, the whole disposition of signs and planets is revealed. So, if the astrologer has well considered the nature and properties of each sign and of the images in each sign, he will easily know the events of the one born, even till death and beyond, as Michael proceeds to illustrate by the case of one born under 3° Aries. The other method is from swellings on the individual's body. 'When we see a *bulla* on the face, we know that Aries dominates.' Roland the warrior had one under the sole

of his foot and could not lose blood or be injured by steel, unless he was struck on the *bulla*.

The subject of astrological elections is touched on in chapters on finding the hour for acting or abstaining, and on what it is good to do and not to do under the hour of each planet. The hour of Saturn, for example, is good for digging, building a house, cutting grass and trees; buying pigs, asses, and mules; talking to rustics about agriculture; buying iron, lead, earth, bricks, and stones. It is not a good time for blood-letting or taking medicine, or going to talk to the ruler to gain favour, nor for war or business or fowling or forming a partnership or treating of marriage or getting engaged (*vadiare feminas*) . . . (M, 10vb; O, 162vb). In the Parisian manuscript (119r) all this is expressed somewhat differently and the hour of Saturn is called favourable to all things of a heavy and hard nature and dry and cold, like iron and lead and every other metal; likewise stones of all sorts as *sillices* and marbles, swampy and broken earth (*terram saldam et ruptam*) and grove, meadow, garden, vineyard, as well as horse, mule, ass, and other animals. It is also favourable for planning deception and fraud against one's enemies, tilling the earth and working with mattock and spade (*ligonizare et vangare*) and doing all that pertains principally to earth. But it is not good to let blood nor take medicine, nor make it anew, nor go to speak to the *podestà* or to the clergy, nor to go fishing, nor to form a partnership, nor to discuss nuptials, nor to get engaged or married, nor to make an agreement with brother- or sister-in-law, nor to arrange anything with a friend, nor to build a wall, nor to buy or cut new cloth, nor to cook nor to eat what is cooked (*nec cusire nec cusitum vescire*), nor to do any good invisibly according to the way of the world or a divine work such as saying prayers, giving alms, etc.

Both of our longer manuscripts have a similar series of pictures of planets and signs of the zodiac, accompanied by geomantic figures, and of other constellations. Sun and moon are depicted seated on four-wheeled vehicles. That of the sun is drawn by four horses abreast, named after the four seasons of the year—on his right spring and summer amid bare trees; on his left winter and autumn amid leafy trees (Plate 1). Luna is drawn by two small oxen and holds a torch in either hand (Plate 2). Above either torch '*Filius pater spiritus sanctus*' is written in small letters;

above the sun's single torch is inscribed '*Pater filius spiritus sanctus.*' Another picture earlier in the manuscripts shows the sun driving four horses by a river flowing from paradise, with a statue of his ill-fated son, Phaethon (*Pheton*), standing on the palm of his left hand (Plate 3). In it the horses are named after parts of the day or its progress: *pyron* (in Latin, *rubeus* or *rubedo*) corresponding to dawn; *flege* or *fulgeos* (in Latin, *amor terrae*) indicating its descent.

A four-wheeled wagon appears in yet another picture: that of the constellation *Agitator sive Eritonos*, the first man to construct a car (*primus homo qui fecit currum*) (Plate 4b). He is shown standing in it and drawn by a yoke of oxen, with a span of horses in front of them. The driver holds the reins which control the horses, from whose collars other reins extend to the muzzles of the oxen.[1] Such pictures indicate that the transition from the ox to the horse as a draught animal was still under way.

Attention was called to this series of pictures by Franz Boll (*Sphaera*, 1903, pp. 274, 441–9, 540–3) and more recently by Fritz Saxl, as a further development from the classical tradition of the Germanicus-Aratus manuscripts, which may be largely the work of Michael himself. Five are peculiar to him; others are altered, e.g. the flying Eridanus is now depicted as a swimmer (or river god, Eridanus being one Latin name for the Po). These pictures also occur in several other manuscripts which may be extracts from *Liber introductorius*, but they are not found in either the Paris or Escorial codices, so that Saxl's statement that they occur in almost all manuscripts of it is quite misleading. In the Escorial manuscript the sole picture, as distinct from a chart or figure, is a sign-man; in the Paris manuscript there are only round medallions displaying the faces of the seven planets, but no pictures of the signs of the zodiac or of other constellations.

The text accompanying such pictures may be illustrated by that for Jupiter. Of the full-length portrait in the Munich manuscript it is said that Jupiter in this figure has every habiliment of good hope for every man born under him. His beret signifies science and fortune of good fame and hope of peace, security, and good standing, and that he ever takes the divine road. His rod

[1] For a similar picture of *Agitator sive Eritonus* from another MS, British Museum, Additional 41600, fol. 45r, see S, III, xliii.

signifies dignity as that of the *podestà* of a city or captain of a castle. His fur coat (*mastruca*) is a sign of becoming a judge, lord of the laws, and wise in good. The gloves in his hand denote a life of solace for himself and others. His purse is a sign of temporal riches, and so on.

Similarly, in the case of the medallion in the Escorial manuscript, which shows only the face of Jupiter, we are told that Jupiter produces a man of natural stature in every part and longitude as well as latitude, of sanguine complexion, white skin, and jaws reasonably coloured. It makes the head large, hair blond and long, face round, broad and pleasant and hairy, nose agreeable enough. Its man naturally delights in some easy, honourable, pleasant, celebrated and quite profitable art such as teaching the science of letters, namely grammar, philosophy, law, astronomy. Also he delights to be a judge, advocate, notary in offices of the commune, chaplain of a prelate, master *in cathedra*, potent of earth, captain of a castle, and ruler of many as an abbot or prior. Also he likes to listen to laws and deeds of the ancients.[1]

Constellations other than the signs of the zodiac may be further illustrated by *Putheus* (literally, a well), which is called by the other name of *Sacrarium* (M, 83vb). It is a sign to ocean navigators, because it follows the tail of Scorpio, and it is said in poetry that the gods performed communion and sacrifice there,

> since it was a secret place and full of spirits of much wisdom, from whose tricks few escape, and they were stronger than others for works of conjuration . . . and in the art of pyromancy . . .

But they were afflicted with many pains of fire,

> and for this reason necromancers have to study *Putheus* or the stars of *Sacrarium* intently

in order to obtain their aid,

> and it is said by many that from it come forth torches and flaming arrows by the work of inferior spirits.

The accompanying picture shows flames and four-winged demons issuing from the constellation.

[1] Note the resemblances to M, 101rb, quoted above at p. 82.

Such a series of pictures in a manuscript of the fourteenth century at Basle (F.II.33, fols. 37v–41r), which I had thought might bear a close relation to those of Michael Scot, proved to be quite different. They are indeed introduced by a human figure with beard and long hair, beret and gown, holding a scroll on which is written: 'The images of this world are subject to the celestial images above (*Ymagines huius seculi subiciuntur ymaginibus supercelestibus*),' who might well represent Michael Scot. But the ensuing pictures are drawn largely in naked outline, and intermingle those of the signs of the zodiac with the other constellations, which also are in a different order from Michael's. They further omit his Hercules, Corona, Pleiades, Lyra, Cygnus, Clocha, Galaxia or *Demon meridionalis*, Putheus, Tarabellum, Vexillum, and the name at least of Delphinus. On the other hand, their Crater, Hydra (*Ydra*), and *Gallina volans* are not duplicated in the Munich and Bodley manuscripts. Their *Eridanus* is replaced by *Fluvius*; *Cetus* is perhaps meant by *Piscis meridionalis*, whose mouth engulfs the end of Aquarius's water-jar (it here looks more like a hose); Capricornus is twice depicted with the tail of a fish; while the car of *Agitator* is gone, and *Auriga* holds only the ends of the reins in both hands. *Voltur cadens* looks more like a turtle; *Voltur volans* holds an arrow in its claw; the figure of the Triangle bears another name; Perseus holds *caput algol* instead of the head of the gorgon Medusa; Centaurus has lashes in one hand and the hind-feet of a huge dog in the other. *Navis* has castles both fore and aft, and, besides rigging, shows rows of heads of nails in the planks of the hull, but for steering still has two oars rather than a rudder. In any case, Michael's break with the Germanicus-Aratus tradition has been carried yet further.

The vague and loose structure of *Liber introductorius* and the very miscellaneous character of its contents are well shown by the rubric, whether it be by Michael himself or some later transcriber of the text, which marks the transition from the second to the third *Distinctio* of that work (M, 118rb; O, 178ra)

> Here ends the second distinction of the first book. Now begins the third in which are contained many chapters on judgments of many things according to what various authors of this art think. And of knowledge of the arts of arithmetic, geometry, chiromancy [geomancy and prophecy].

As a matter of fact, this third distinction is more unified than its predecessors, being largely devoted to astrological interrogations, as its opening in the earliest manuscript (P, 85v) indicates:

> Here begins a little doctrinal note and it is the preface of this following book concerning interrogations and judgments on the interrogations of seekers, and it is a continuation of the second distinction. Whoever wishes to do anything, first ought to consider the affair he intends to enter on . . . So ends the preface. Then begins the book of interrogations and judgments to the interrogations of seekers. When you are asked as to some interrogation . . .

In answering interrogations it is essential to find the sign of the ascendent, or more particularly the degree of the sign and present hour, by the astrolabe, whose composition and operation are set forth, or by the quadrant. Not only the signs and the planets in them, but also the fixed stars may be taken into account (M, 125vb; O, 189rb). There is also a way to render account, on any question, according to the lordship of the planets through the hours of day and night, to the man who comes to consult you before he states what he wishes to say to you, what he wants and concerning what he intends to question you, or why he comes to you. Interrogations made and answered should not be repeated, because the first reply is truer than following ones.

> And against this many err, such as geomancers who cast points and form a figure every time that they remember any affair of their own or of others (M, 119vb–120ra).

Some also take great care to put the question at a certain hour of day or night in order to have a good sign as the ascendent and a lord of the ascendent of good signification. And they err. Messahalla, Dorotheus, Alkindi, and Alcorayth are said to agree that, in answering interrogations, the two chief things to note are the lord of the ascendent and the position of the moon. Albumasar, however, advised that five points be noted (M, 131va): (1) the lord of the fourth house; (2) the lord of the house of the moon, or the moon itself; (3) the planet to which the moon was joined before; (4) the lord of the house of *pars fortunae*; and (5) the lord of the fourth sign from the moon, in which it is proved to have delayed. In what follows, we shall find Scot sometimes taking his advice. I did not see much

evidence of his having copied particular interrogations from Zael, *De interrogationibus*, as printed in 1484 and 1493. He may have done so from the *Book of Nine Judges*, or from works still in Arabic when he wrote. He states that he has written this section on interrogations 'with great labour of spirit and mental ingenuity to the grace of God, from whom proceeds every best gift of salutary science' (M, 119va–b).

We may begin with two examples accompanied by *figurae coeli*,[1] concerning a prince, confronted on two separate occasions with a rebellious city. In the first case the ascendent was in the third degree of Aries; in the second, in the sixteenth degree.

> As to the first, I began, as the custom is, to seek the lord of the ascendent for the emperor inquiring [presumably Frederick II] and the lord of the seventh house for the hostile party, so that I might know from their positions in the signs and in the *figura* what would be the outcome between the interrogator and his enemies.

Michael found Mars, who was lord of the ascendent, in the fourth house or 22° Cancer, and Venus, who was mistress of the seventh house, likewise in Cancer, only about one degree from Mars. This indicated that the enemy would seek peace and submit, because while Mars is one of the superior planets, masculine, strong, and potent in all connected with war, which is his speciality, Venus is an inferior planet, feminine, weak, timid, and impotent in war.

> So this conjunction [of Mars and Venus] signified victory of the prince from fortitude over his adversaries, and promptly, without delay, because the conjunction was in a quadrate angle. For the four principal angles signify things present and which are under way, especially because it was in the sign Cancer, which is tropical, that is, conversive.

If it had been a two-bodied sign, victory would not have come so soon, and it would signify that the peace was half-full or made twice. If it had been a fixed sign, it would also have been made more slowly. Scot also observed the moon and found it, too, in Cancer, which further indicated that the victory would be lasting.

In the second example, the lord of the ascendent for the interrogating prince, and that of the seventh house for his

[1] They occur, however, in the Paris MS at fols. 99v–100r, just before the end of the second Distinction: '*Explicit secunda distinctio. Incipit tertia super creatione co'rs*' (?) *et signis ac planetis*,' which indicates a different arrangement from the other MSS.

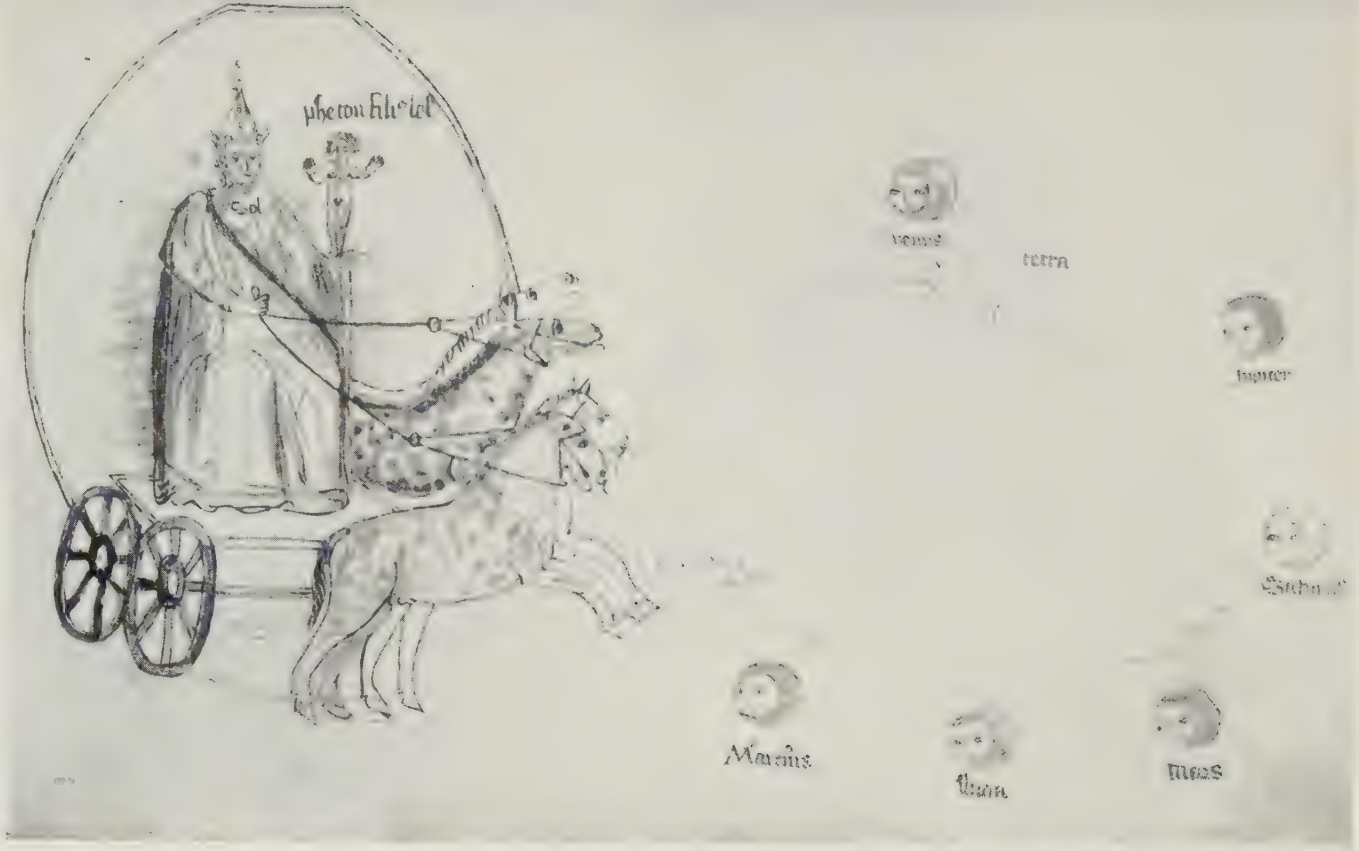


PLATE 3 *The sun driving with a statue of Phaeton on the palm of his left hand*

PLATE 4a *The Great and Little Bear and the Dragon, constellations from the Bodleian manuscript*

PLATE 4b *Agitator and the first car*

enemies, were again Mars and Venus. But now Mars was just entering Leo, while Venus was five degrees farther on.

> And this separation signifies separation of will of those rebels of making peace with the prince, not from love but from fear.

Scot wished to know if after this separation Venus would join some other planet. He found that it was two degrees away from conjunction with Saturn, and so was going from bad to worse, since Saturn in such a case signifies prisons, lamentations, labours, plaints, and sorrows. All this was still in Leo, a fixed sign indicative of slowness but also of stability and firmness. But this conjunction was in the fifth house beyond the fourth angle, signifying that their tribulation would endure until the end of persecution by the prince. It also signified that the hostile party would commend itself to a certain religious old man to escape the hands of the prince, and that this would avail them little. 'And Jupiter was retrograde in the [sign of the] ascendent.'

> When you are asked by a man whether he ought to beget or have an heir from his wife or mistress, whom he has and holds (M, 141ra), or not, or if you are asked by a woman concerning her man, be he husband or lover, examine the ascendent and its lord as to the interrogator, if degree of the moon, and the moon similarly in its disposition as to the same. Afterwards examine the seventh sign and its lord as to the other party. For if both lords, namely that of the ascendent and the seventh, are in conjunction with the lord of that house which signifies sons and daughters, or with the lord of the eleventh house, that is, an eleventh house to which the moon gives good testimony, then this is a sign that he will beget and she conceive, God willing, that a virtuous woman is rendered pregnant by him. But if the lord of the fifth [ninth?][1] house is in conjunction with the lord of the seventh or eleventh, in a good place, and the moon or other favourable planet in aspect, they will praise the lord of the ascendent or fortune. Or the same result, if fortune in a good place is in aspect with the ascendent or lord of the ascendent.
>
> But if things are otherwise, there is no hope whatever of conceiving according to nature. But by divine grace there may be hope of generating heirs, since God is *natura naturans* and so above *natura naturata*, having power to do all that He wills . . . as was once shown in the case of Elisabeth, mother of John the Baptist.
>
> If it is inquired whether soon or late, tell him according to the computed degree of the first and fourth sign and its lord (?), which is discerned by mobile, fixed and common sign.
>
> When you are asked whether a city or castle or *rocha*, or knight

[1] The numeral is hard to make out.

or woman, loved or hated, or religious house or villa, etc., will be besieged by enemies up to one month or not, or in this entire year or not (M, 142va):

Examine the ascendent and its lord as to the interrogator or for the place about which and for which the question is put. Then examine the fourth house and its lord especially for the place or person concerning which or whom the question is put—city or castle, etc. Then examine the seventh and its lord for the enemies of the place or person and the occasion of injury.

For if the lord of the ascendent is well disposed in the ascendent or in the tenth or other good place, to which the moon renders good testimony in a laudable place and is not vitiated in evil fashion, this signifies that the place is completely protected from ill from enemies, and that what is, or has been assumed, evil is annihilated, God granting. And if the lord of the ascendent is not in the ascendent well disposed, but elsewhere receives good aspect from the good, and is hidden from the aspect of the evil, then the same is signified, and conversely. One should revert entirely to testimony of the moon for this, that whatever is required in the lord of the ascendent is required in the moon for any questioner or concerning what is asked. Also note that, if the lord of the fourth is well disposed in the fourth or in the ascendent or in the tenth or other praiseworthy place and aspect, the answer is the same.

But if it is the contrary with the aforesaid, you will judge all contrary. For instance, if the lord of the ascendent, or of the fourth, or both lords, are ill disposed, as in evil aspect or opposite evil or in evil place, such as the first (?) house or eighth or seventh, and the lord of such places is also ill disposed, in its own place or in an evil place or in a good place with an evil [planet], then the planet is the worst sign. As, if it is evil in the ascendent or in the fourth, and the moon is found vitiated, by which fault it renders evil testimony to the lord of the ascendent, then it signifies that the place is harmfully besieged by enemies.

And if the lord of the seventh is strong in the fourth and evil, and the moon is in a bad place, or otherwise vitiated assuming it to be in a good place, then tell him that it is a sign of siege by enemies openly harmful to him. Whence it should be seen which of the two is stronger, namely, the ascendent, lord of the ascendent or fourth or seventh, and then their disposition, good or ill, will become plain.

The instructions as to when to begin to build a ship or other types of maritime craft are briefer (M, 136va). The ascendent should be a fixed sign, such as Scorpio or Leo, and all the cardinal angles should be fixed, the moon in an angle of the sky, and the lord of the ascendent in the ascendent or tenth or eleventh, well disposed in laudable aspect to the good and without fault signifying evil. Let the place of fortune be in mid-sky or in the ascendent; the lord of the ascendent in one of its

dignities, with the moon, if possible . . . Also let the moon be in its greater movement and speedy, not tardy. When the ship is to be first launched, have the moon waxing above earth and not below, in a good sign, as in Capricorn or in Libra, and not in a bad sign. Nor should one go to battle against one's enemies when the moon is fortunate, but conversely. Similarly, a war is odious if it is begun by astrologers.

Michael also has a chapter on telling the would-be interrogator beforehand what he has come to ask about, or why he comes to you, or what he has in his hand. It opens with the statement that a successful astrologer is popularly regarded as a god and a prophet (M, 126rb).

> And that every man who is ignorant of this science may be greatly astonished after he has come to you, and may put the greater reliance on your words, you should address him thus:
>
> My lord, or, my dearest friend, I already am aware by the skill of my art of what you want now, that is, of what you intended to speak with me, or have advice, and what you have in your hand, if you have anything.

This is done by finding what sign is in the ascendent and what planet is its lord. Every hour of the day or night is divided into three parts. The sun rules the first hour of Sunday, Venus, the second, and so on. This method is not Michael's invention, but is found in ancient records which the supreme philosopher, Plato, who for twenty-three years taught the great Aristotle, compiled, although Michael inclines to the belief that they go back to ancient codices of Solomon. An instance of its specific application (M, 127rb) occurs if, for example, someone comes to consult you in the hour of Saturn, who is cruel, evil, and very harmful to almost all persons, and *incongrua* except about the end of its régime, near the hour of Jupiter. If the inquirer comes to you early in the hour, tell him that the object of his inquiry contains blackness or whiteness or both, and is complete enough in itself, and is not of great value. In or near his hand is something green, or clear like glass or crystal, or something which was in fire or near fire. If he comes in mid-hour, it is concerning something feminine in whole or part such as childbirth, and whether the child will be a boy or girl. If in the closing third, he is concerned with sickness.

There are six ways in which an astrologer may be easily deceived and led into error. The first is if his instrument, such as astrolabe or quadrant, is false, or if, in sighting, he takes the shadow on uneven ground or with crooked wood. Second, if his manual of the art or exercise, as of judgments, and other doctrine, as of rules, is false. Third, if the astrologer is not well trained in the art, nor mindful of its doctrine. Fourth, if the questioner does not know how to interrogate the astrologer rightly. Fifth, if he makes the observation at a time when full of hate or love, since these two drive away truth of doctrine, or if he does not know whether the sun has passed mid-sky or not. Sixth, if fortunes are equal, and the evil are in probation (M, 123va).

In *Liber introductorius* Michael Scot neither condemned geomancy as an evil form of divination and magic, nor openly asserted its claim to an astrological basis, although in one place he associated the sixteen geomantic figures with the twelve signs of the zodiac, giving two each to Taurus, Gemini, Virgo, and Libra (M, 79rb–80vb). But it would seem that its method of obtaining sixteen figures by casting four rows of grains of sand, or marks made by the fingers of one hand, in the dust, and cancelling out pairs until only one or two grains or marks remain in each row, was as open to the influence of the stars as his own practice of sending an interrogator to pick up some chance object in the street. In one passage he mentions geomancers as especially apt to offend against the rule that once a question has been asked and answered, it should not be repeated (M, 119vb–120ra). In another he speaks of the geomancer who, when he thinks he is in the house of fortune, is found unfortunate in his judgment (M, 72rb). But such disappointment is also liable to come to the physician, astrologer, alchemist, and experimenter. It therefore seems that there is no cogent reason why Michael may not have tried his hand at a geomancy, and one which closely resembles his astrological style of writing is found in a collection of such treatises in a manuscript at Munich, which admittedly is of the sixteenth century.[1]

The text states that there are sixteen geomantic figures, of

[1] CLM 489, fols. 174–216v: '*Incipit liber Geomantiae Michaelis Scoti. Geomantia dicitur ars iudicandi per terram . . . . . Explicit liber Geomantiae excellentissimi Michaelis Scoti.*'

which four are called mothers; four, daughters; four, granddaughters; two, witnesses; and two, judges. The first figure, of Acquisition, is that of the planet Jupiter and the sign Aries. It is *optima*, fortunate, earthly, fixed, masculine. oriental, airy (this seems to conflict with 'earthly'), hot and wet like blood. Of colours it signifies white mixed with yellow declining to red; of tastes, sweet; of odours, fragrant; of stones, the hyacinth; of metals, gold and brass; of trees, fruit trees; of days, Thursday; of months, March; of time, years; of figures, a man of mediocre stature, handsome, rather tall, with pleasing eyes, a thin nose, beautiful forehead, thin chin, long neck, hairy, and having two large upper teeth; extravagant, greedy of gain, desirous of some degree of honour and lordship, benign, faithful, and giving many goods to others for their service and friendship. It signifies bodily health, pecuniary gain, male offspring, a hot illness and quick escape, reversion, the fugitive life of an absentee, a man of good condition who loves easily and faithfully . . .

Of four *modi*, *occupatio* is when the figure of the question is like that of the thing sought. *Coniunctio* is when the figure of the questioner is near the figure of the thing sought. *Translatio* and *Transmutatio* are when the figure of the thing sought is like the figure of the questioner. It is also asked what figures, direct and indirect or retrograde, are good or bad. Questions are put as to life, financial gain, human condition, sickness, brothers, letters and messengers, lost objects, partnership, journeys, rumour, inheritance, building, and so on.

# XI · Alchemy

Alchemists were closely associated with necromancers and workers of other occult arts by Michael Scot in several passages. In one he observes that a sage sometimes seems to know less of practical matters than a rustic who knows no philosophy, and is easily deceived by (E, 2rb)

> alchemists, necromancers and enchanters, who conceal much from other people, which is all given from above.

Later on in the prologue to *Liber introductorius*, alchemists are again spoken of in the same breath with necromancers and with operators of the notory art (O, 20va; M, 16ra), in which knowledge was supposed to be revealed immediately in answer to set prayers, invocations, and ceremonies. In a later marginal note we are told that one born under a certain constellation will be inclined to experiments and incantations, to compel spirits and work marvels, to use metals, and that he will be 'alchemist and necromancer' (M, 83vb; quoted Brown, 185, from O, 113). Alchemy is also listed among sciences and arts which are somewhat palliated under the name of astronomy, such as geomancy, hydromancy, aeromancy, pyromancy, spatomancy, augury, physiognomy, necromancy, praestigiomancy, alchemy, *nothoria*, lots, *incantatio*, *constellatio* (E, 57vb; O, 22ra–b). In a fifth passage the association is with the less disreputable arts of medicine, astrology, and geomancy. Stating that their practitioners are often found in error, Michael adds (M, 72rb):

> The like happens to the alchemist who, when he thinks that he has done everything well, remains deceived and derided.

But in yet another passage, in which the alchemist is mentioned with representatives of such occult arts as pyromancy and interpretation of dreams and horoscopes, it is said that he almost

transcends or outdoes the heavens, in that he strives by the virtue of the four spirits to transmute the vile metals into gold and silver and to make a most perfect water from them (E, 59ra; M, 18rb; O, 23va; P, 36vb).

With the four spirits which have just been mentioned Scot associated the four elements: fire with sulphur, air with orpiment or arsenic, water with sal ammoniac, and earth with quicksilver (M, 95va). He held that there were seven species of metals, all composed of quicksilver, sulphur, and earth. Gold contains more sulphur than quicksilver; silver has more quicksilver than it has sulphur and earth; iron, more earth than quicksilver, and so on. He believed that gold could be made medicinal (Oc, 50ra), but that its multiplication by alchemy was only apparent.

> The metals are sophisticated by the doctrine of the art of alchemy, with addition of powders in which the spirits play a part, of which there are four species: namely, quicksilver, sulphur, orpiment and sal ammoniac. From gold, with some additions, is made more gold in appearance; from silver and whitened mercury is made more silver in appearance.

So far Scot would seem sceptical as to the transmutation of metals. But we have heard in another passage of one's good luck in finding a powder potent to make gold, while one interrogation of the third *Distinctio* is whether a medicine that is in the making, either alchemical or for the sick, will be a success (M, 142ra). Yet another statement that, where heat and sulphur abound underground, 'gold grows and is born' (H, 296), would seem favourable to attempts to imitate this natural process. In a fourth passage white, black, and yellow sulphur are distinguished; but it is added that each

> has certain virtues of great worth, as in alchemy of commuting metals *et ad faciendum focum zambanum*, unguents for the scab, etc. Suffumigation of which whitens yellow hair, and the leaves of rose and lily. And when it burns, it makes the air fetid (H, 297).

In other passages of *Liber introductorius* Scot assigns a wider field of activity to alchemists than mere gold-making. In listing artificial preparations from eggs (M, 117rb), he mentions first an oil made by apothecaries to beautify the faces of women, then a water by alchemists, and an amber by merchants. By another

preparation all the spots on cloth are removed. To make an egg hard enough for boys to play with, soak it in very strong vinegar for a day only, and then expose it to the sun for several days. The reason for its hardness is that the humidity in the fragile shell has been consumed. Another useful experiment is to keep an egg in hot ashes for four days or more, consuming the humidity by a temperate heat, which is, however, insufficient to cook the egg.

> It is further said that, if an egg is placed beneath hot manure and left there for nine days or more, it will be converted into a water of great worth in the confections of alchemy.

In the Bodley manuscript matter is said to be transformed by the power of fire into sulphur or quicksilver, and that such substances are called spirits because they evanesce and return to solid form (O, 123rb).

When we recall the detailed information concerning necromancy which Scot dispenses in *Liber introductorius* itself, it is perhaps not too much to allow him the minor inconsistency of a separate alchemical text. Such a text is preserved in three manuscripts: one of the later thirteenth century (Cambridge, Gonville and Caius College 181, pp. 19–32); one in part of the late thirteenth century (Oxford, Corpus Christi College 125, fols. 97–100v); and one of the fourteenth century (Palermo, Biblioteca comunale 4 Qq A 10, fols. 357–363r).[1]

The work opens with the statement that the noble science is utterly rejected by the Latin-speaking world because of the confusion and obscurity which prevails in the books of the philosophers on the subject of the transmutation of metals. In an attempt to clear the matter up, our writer has travelled everywhere, including ultramarine regions, and inquired of sages and philosophers, Latin, Iberian, Arab, Saracen, Armenian, Theophili, Greeks, in all parts, provinces and tongues (*or*, of sophistic and wise men, Latins, Hebrews, and Arabs). It presently appears that Michael Scot is translating the information which he has gathered, and is assisted in this by a Master Theophilus, who is an official of the Saracens in Tunis. Secrecy

[1] On these MSS see the successive papers of C. H. Haskins in *Isis*, X (1928), 350–9; D. W. Singer, *Isis*, XIII (1929), 5–15; and S. Harrison Thomson, *Osiris*, V (1938), 523–59.

is enjoined upon the reader; the seven planets and twelve signs are listed—rather superfluous information not uncharacteristic of the author of *Liber introductorius*, to whom would also be congenial the expatiation which follows upon the degrees of hot or cold, wet or dry, of the seven metals, and their astrological relationships. The Cambridge manuscript next introduces a treatise on salts and alums, to which there is merely a cross-reference in the other two manuscripts, and which is probably not by Michael Scot. It is a different work from Rasis, *De aluminibus et salibus*, which Gerard of Cremona had translated in the previous century. It cites 'Michael Scotticus' as well as Hermes, alludes to such regions and places as India, Morocco, Saracen Armenia, Alexandria and Aleppo, Hungary, Barbary, Spain and Sardinia, and mentions more than once apothecaries of Montpellier.

We then come to the major mastery, according to Master M. Scotus, how copper is transformed into gold:

> Take the blood of a ruddy man and the blood of a red owl, burning saffron, Roman vitriol, resin well pounded, natural alum, Roman alum, sugared alum, alum of Castile, red tartar, marcasite, golden alum of Tunis which is red, and salt.

These ingredients are to be pounded in a mortar, passed through sieves, treated with urine of the animal called *taxo*, or with the juice of wild cucumber, then dried, brayed again, and put in a crucible with the copper. These or similar ingredients are repeated in other connections. The Oxford and Palermo manuscripts have further mentions of Michael Scot and Brother Elias, who was minister general of the Franciscans, in connection with this major mastery, a similar minor mastery, and the subsequent text, but no more names are cited in the Cambridge manuscript. This fact rather increases our trust in its possible authenticity, while the needless repetition of Michael Scot's name and the introduction of Brother Elias and other new names impress one as being later interpolations.[1] Professor S. Harrison Thomson

[1] It is not improbable, however, that Friar Elias was devoted to alchemy, since not only are alchemical tracts ascribed to him in various manuscripts, but he is already accused of such devotion to the Hermetic art by the thirteenth-century Franciscan historians, Salimbene and Angelo Clareno. See Affò, *Vita di frate Elia*, Parma, 1819, p. 58; ed. Lempp, *Frère Elie de Cortone*, Paris 1901, pp. 121–2; Golubovich, *Biblioteca bio-bibliografica della Terra Santa*, 1906, I, 116–17.

would rather follow the Oxford manuscript as far as it goes, and holds that 'the genuineness of that much of the work seems reasonably assured. But beyond that point the two remaining MSS have very little in common' (p. 557).

A bit of alchemy ascribed to Michael Scot in a manuscript at Göttingen of the fourteenth to fifteenth century (Hist. nat. 75, fol. 18v) may be a fragment from this treatise. Compare its opening words, '*Secundum quod in diversis . . .*' with the other's rubric, '*Incipit liber magistri Miccaellis Scotti de arte alchimie secundum quem in diversis provinciis . . .*'

A discussion whether true gold can be made by art or not, which is found in at least seven manuscripts of the fifteenth and sixteenth centuries, is sometimes entitled *Disputatio Scoti*; this is once ascribed to Scotus on the divine art, once to Michael—to which Scotus has been added in a different coloured ink, and is sometimes anonymous. But I have not seen it attributed to anyone other than Michael Scot, unless we take Scotus to mean Duns Scotus.

A 'light of lights' (*lumen luminum*, a common alchemical title), concerning salts and alums, is ascribed to Daedalus in two manuscripts, in one of which he is further called Grecus. It is also said in one of these two, and in a third manuscript, where it is anonymous, to have been translated by Michael Scot. In a fourth codex it is attributed to Averroes, but Michael is not named as its translator. In the manuscript, now 119 of the Riccardian Library at Florence, where the translation of the anonymous text is assigned to Michael, there occurs later on a rearrangement of the text, which is entitled *Liber Dedali philosophi*. The two were printed by J. Wood Brown in his *Life and Legend of Michael Scot*, 1897, on opposite pages, 240–68. They differ from the treatise on salts and alums in the Cambridge manuscript mentioned above. Secrets as to transmutation are occasionally disclosed.

In two other British manuscripts[1] of the fifteenth century is a 'Document of a spirit handed to Master Scotus on the virtue of the toad or philosophic stone or bird phoenix.' After a prose

[1] At the Bodleian, Oxford, MS E Musaeo 63, fols. 77–78v; at Cambridge, Trinity College 1399, fols. 1v–4. See D. W. Singer, *Catalogue of Alchemical Manuscripts*, II, 800; *Isis* 13 (1929), 11–12. Mrs Singer has not found the metaphor of the toad in MSS earlier than the fifteenth century.

prologue there follows a poem in two parts of fifty-nine and thirty-six lines, opening, '*Sum mirus et novus . . .*'

In a very extensive alchemical bibliography, which is preserved in Latin MS 273 of the sixteenth century in the Barberini collection at the Vatican, there is listed at fol. 301r:

> Michael Scot on the transmutation of metals, edited and composed in concord with the supreme masters and philosophers, Baal the Saracen and Theosius [Theodosius?].

It opens, 'There are seven planets (*Septem sunt planete*) . . .' which suggests the opening of an anonymous alchemical text in Latin MS 5487, fifteenth century, fol. 1r–, of the National Library at Vienna, '*Septem sunt planete secundum cursum . . .*' The catalogue has this text extend to fol. 13r, but when I examined the manuscript in 1931 I thought that it ended sooner. But it also suggests Haskins' third paragraph of the first work which we saw attributed to Michael, opening: '*Septem sunt planete scilicet Saturnus . . .*' In the same alchemical bibliography there follows a Question of Michael Scot which opens, 'You inquire whether by art (*Queris utrum per artem*) . . .'

Finally, in the seventeenth century, in Zetzner's *Theatrum Chemicum*, V (1660), 713–22—also in the earlier edition of 1622—a curious question as to the nature of gold and silver (*Quaestio curiosa de naturae solis et lunae*) is printed under the name of Michael Scot. It opens and closes:

> Ut finis per omnia suo correspondeat principio . . . . . de natura Solis et Lunae. Deo laus et gloria per semper secula. Amen.

# XII · Michael Scot and Magic

This chapter is entitled 'Michael Scot and Magic,' rather than 'Michael Scot as a Magician,' because it is very doubtful if he ever practised magic in the sense in which he used that word, and as later legend depicted him. Dante characterized him as knowing magic rather than as performing it.

> Michele Scotto fù, che veramente
> Delle magiche frode seppe il giuoco.

For Michael the art of magic was

> not found nor received in philosophy, because it is the mistress of all iniquity and evil, often deceiving and seducing the souls of its practitioners and injuring their bodies (O, 22rb).

He identified it with the invocation of demons and nigromancy, rather than with natural magic—a term which he does not use —which works wonders by employing occult forces in nature, and the power of words and numbers, and, above all, the influence of the stars. In these he believed and he admitted them to philosophy. They were good, but the magic art was bad and diabolical. It employed immoral and criminal practices, and loathsome and nasty ingredients. But, as we have seen, the demons existed and were a part of Michael's universe. Their magic could not, therefore, be dismissed as unnatural. Nor was it false, though it might be deceptive, misleading, and dangerous, destroy divine religion and encourage the cult of demons. It was the demons who instructed mankind

> in various doctrines of theirs which today are called arts, and properly so in the case of arts which today contain turpitude, horribleness, insanity, like spatomancy, necromancy, etc. (M, 19ra).

Demons form various figures in the clouds, destroy bridges,

uproot trees, and sometimes remove the roofs of houses (M, 10rb). But they obey conjurations. There are certain names of spirits whose virtue is so great that the spirit will readily respond and fulfil all things marvellously according to the precept of his invoker. A list of the names follows. Scot also distinguishes spirits in the north and in the south, names two or three, and says that the wisest demons, who give responses when conjured, dwell in certain images of the constellations (O, 21v), as we have seen in the case of Putheus. Angels, both good and bad, can assume from the ether or air bodies which are visible. The consecration of a spirit in ring or bottle cannot be accomplished without many sacrifices, prayers, and suffumigations, contrary to the sacrifice of the living God. Seven angels are rectors of the seven planets. There are seven senators of the seven firmaments —Orphymel, Tingra, Dapnael, Kabura, Asinor, Tascar, and Boel. Also seven rectors of the seven metals. The right hours of day and night for prayers, conjurations and colloquies of demons are indicated at length (M, 108va–b). Knowledge of astronomy is needed in dealing with demons. When spirits of the air are invoked, their invoker should stand within a circle in a place duly required by his art and utter the names of the spirits with a firm face and loud voice, while holding a book or naked sword in his hand (M, 114va).

In *Liber particularis* we are informed (Oc, 1va) that the astrolabe is sometimes used in invoking evil spirits. But it is immediately added:

> which the Roman Church condemns and forbids to every good Christian under the penalty of anathema. The reason is lest they make free with the name of the stars to perpetrate evil, since the stars do not have the power to work any evil. But there are on their surface certain very wise spirits, who are assigned to certain works of malignity.

Magic had often been discussed in the centuries before Michael Scot, and the wording of his definition of it, although not quite the same, bears close verbal resemblances to that which closes or was added to the *Didascalicon* of Hugh of St Victor (1096–1141).

The three Magi of the Bible were commonly regarded in a more favourable light than were ordinary practitioners of magic.

Scot, however, while granting that the word magus has a threefold meaning: trickster, sorcerer, and sage (*illusor*, *maleficus*, *sapiens*), holds that the three kings were all three of these before their conversion to Christianity, after which they became 'witnesses and doctors of the Supreme King.' Michael, whose account seems based in part upon a spurious sermon attributed to Chrysostom, says that the three Magi came respectively from the three continents of Europe, Asia, and Africa. In accordance with a prophecy of Balaam, they were wont to meet annually on the day when the birth of Christ was expected. This time they stood in adoration for three successive days on Mount Victorialis, until a star appeared in the form of a most beautiful boy wearing a crown, who spoke thus to them:

> Go swiftly to the land of Judah, where you will find the king whom you desire to see, born of a virgin, and this star is Christ and Lord of the whole world.

Descending from the mount, they took great gifts of gold, incense, and myrrh, such as befitted a king, to offer to the newborn babe. They then hastened to Bethlehem on dromedaries, which cover as much ground in a single day as a horse can in two months. Beside the star, three suns appeared at equal distance apart, then united to signify the Trinity, and Octavianus, the Roman Emperor, saw in the centre of the solar disk the Virgin and Child (M, 2va; O, 3ra–b). Such was the pious credulity of Michael Scot and his readers!

Previous accounts often spoke of five species of magic. Scot does not observe that division but speaks of twenty-eight varieties of divination (M, 17rb; O, 22ra; P, 35vb). Of these, a number are more or less associated with magic. Necromancy, which we have already seen identified with magic, is performed more by night than by day, by sacrifice of the blood or other part of the human body, dead or living, for demons crave human blood or flesh, and often appear in the guise of the dead to answer questions. But sometimes the necromancers or magi in their experiments mix a water of strong wine recently received and exorcized with the blood. Aerimancy is the art of divining from aerial phenomena: clouds, bows, fog, lightning, thunder, comets, and falling stars. Cloud formations in the shape of a dragon, horse, or man betray the presence there of demons, and

it is a good time to invoke them with a conjuration. Hydromancy is the short art of experimenting and divining persons' private concerns by gazing into water, ice, crystal, a mirror or some other clear surface. It is performed in the hour of the planet Jupiter, the sun, or Mercury, in a secret place, by a virgin of five or seven years, who repeats after the master, word for word, over human blood or the bone of a corpse, a long conjuration which begins:

> In the name of Father, Son and Holy Ghost, and in the name of the most secret name of God, and the name which is above every name, O noble prince of many spirits and most sacred spirit, Floriget . . .

*Malfiecus* or sorcerer is rather oddly described as

> he who interprets characters and philacteries, incantations, dreams, and makes ligatures of herbs.

A *praestigiosus* deludes men by fantastic illusions as to transformations by diabolical art, such as changing a woman into a dog or bear, making a man appear a wolf or ass, or causing a human head, hand, or foot to look like that of an animal. A *sors* for the discovery of theft is given, which involves the use of an incantation, yet it is stated that lot-casting is approved not only by Augustine but by 'infinite examples of sacred Scripture.'

Although Michael Scot professedly condemned magic, he displayed a wide acquaintance with books of magic, which he failed to separate sharply from the treatises on astrological images of which he openly approved. He states that such books are unknown to many men, who think that they know all about nature, but have never tested the books of images and secrets, which exalt man to the threshold of paradise. Such works are the *Book of Piety* of Aristotle, the *Consolation of Medicine*, Lucidarium in nature, Lucidarium in divinity, the *Septuaginta* of Alchiranus simple and compound, the notory art of Alpharus, Adam, *Idea*, Floron, Peter Abelard,

> and certain others whose names we do not wish to reveal here, lest we become too prolix (E, 2rb–va).

Towards the close of the prologue of *Liber introductorius*, Peter Abelard is again mentioned, together with Simon Magus, and an *ariolus* of Alexander or Alexandria (M, 17va). Simon Magus

also heads another trio with Virgil and Peter of Alexandria. Later, in the second *Distinctio*, Peter Abelard and Simon Magus are cited concerning necromancy and evil spirits, images, and incantations, together with *Idea* and the art of Solomon, a new name—Ottomellus of Parma, and that old favourite—Virgil of Mantua (M, 114va).

Elsewhere the necromantic work ascribed to Solomon had been more fully entitled *The Angelic Book of the Art of Solomon*; that attributed to Adam, as *The Book of Perdition of Soul and Body* (M, 114ra). It was further described as a systematic treatment of all the functions of demons, their names, the parts of the world in which they are penalized to dwell, when they can be convoked, and from what orders they fell. Further mentioned is a *Book of Consecration from certain experiments*, which is no sooner opened than one hears the clamour of those spirits in whose name the book was consecrated, saying with one voice:

> What do you want? What do you seek? What do you order? Say what you want and it shall be done forthwith (M, 114rb).

But unless one understands astronomy one cannot deal with such demons successfully. It would seem that Michael has confused the gates of hell with the threshold of paradise, and that he has imparted too much necromantic detail to beginners in astronomy.

However he was not unique, or was not to remain unique, among Christian writers, in this acquaintance with occult literature and with the activity of demons. We hear elsewhere of *Idea Salomonis et entocta* and of *The Shadows of Ideas* (*De umbris idearum*) of Solomon.[1] William of Auvergne, bishop of Paris, who died in 1249, showed a similar, if less favourable, knowledge of magical books, and included a long section on demons in his *De universo*. Albertus Magnus, in *Speculum astronomiae*, attempted to distinguish between licit and illicit works on astrological images. The demon, Floron, was cited by Cecco d'Ascoli in the early fourteenth century. But Michael Scot was perhaps alone in naming Abelard as an authority on magic!

[1] *Magic and Experimental Science*, II, 280, 289, 351, 964–5. Probably *entocta* should be *eutocta* (εὔτοκος). In a MS at the Biblioteca Nazionale Centrale of Florence, II, iii, 214, fifteenth century, fol. 26v, a work on exorcisms opens: '*Incipit tractatus discipulorum Salomonis scilicet fortunati eleazari macari et toz greci et est super eutuntam et super ydeam Salomonis.*' Here *eutuntam* suggests εὔτυκος, εὔτυκτος or εὐτυχής.

'An Experiment of Michael Scot, the necromancer' might seem to indicate that he practised as well as studied magic. It is found in a manuscript of the fifteenth century, but is the last of six such experiments said to have been extracted from 'a most ancient book.'[1] What lends a certain further verisimilitude to it is that it is addressed to a Philip, while he lay sick in the city of Cordova, who may have been the Latin translator, usually called Philip of Tripoli, of the *Secreta secretorum* of the pseudo-Aristotle.

A probably late work of magic which has been fathered upon Michael Scot occurs in a manuscript of twenty-four leaves written in Germany in the sixteenth century, and now John Rylands Library, Manchester, 105, *'Interpretatio et Instructio pro Discipulis seu amatoribus Artis magicae . . . . . Michael Scotus prage in Bohemia pridie Idibus februarii MCCLXI.'*

[1] Florence, Laurentian Library, Plut. 89 sup., cod. 38, fol. 244v. The other experimenta are: 1 & 3, '*Ad amorem*'; 2, '*Ad invisibilitatem*'; 4, '*Ad dementiam cuius vis*'; 5, '*Ad somnium*.' The '*Experimentum Michaelis Scoti Nigromantici*' begins at fol. 256v, and has been faultily edited by Brown, pp. 231–4.

# Appendix I

## MANUSCRIPTS OF *LIBER PARTICULARIS* AND *LIBER PHYSIOGNOMIAE*

PERHAPS the reader should first be reminded that P, fols. 129r–162v, offers a text of *Liber particularis* which is both acephalous and unfinished, but in some respects fuller than that of Oc. On the other hand, it fails even to mention *Liber physiognomiae*.

Of Milan, Bibl. Ambros. L.92.Sup., the following fuller description may be given than is found in Haskins, pp. 291–8, where it is merely cited repeatedly. It is a parchment, two-columned MS of the thirteenth century, with illuminated initials in gold, but on some pages the writing has faded or been rubbed off.

*Fol. 1ra, Rubric:*

> Incipit liber particularis Michaelis Scotti astrologi domini Frederici Rome imperatoris et semper augusti quem secundo loco breviter compillavit ad eius preces in nomine ihu xri qui fecit celum et terram in intellectu prohemium.

Incipit: Cum ars astronomie sit grandis . . .
2rb: Capitulum de ordine temporum
25rb: a T map
25v–26r: coloured charts of the elements and other groups of fours
29vb, 41va–b, 42v, 47v, 49r, 69ra: other coloured figures
88vb: . . . vobis domine imperator sufficiat ad presens de recitatione mundi mirabilium que deus fecit cum magno delectu ad instar ioculatoris[1] et adhuc facit continue et de expositione fundamenti terre, volentes hic finire secundum librum quem

[1] i.e. like a juggler, sleight-of-hand performer, or public entertainer. Du Cange does not cite Michael Scot.

incepimus in nomine dei cui ex parte nostra sit semper grandis laus et gloria benedictio et triumphus in omnibus per infinita secula seculorum. Amen.
89ra: Explicit secundus liber Michaelis Scotti qui dicitur liber particularis.
Rubric: Nunc incipit liber physonomie quem compillavit M. Scottus ad preces domini F. Ro. imperatoris, scientia cuius est preciosa et multum tenenda in secreto pro eo quod est magne efficatie, continens secreta artis nature que sufficiunt omni astrologo. Et cum hec pars libri physonomie constet ex tribus partibus, hoc est prohemium.
Incipit: O imperator inter cetera . . .
90va: Explicit prohemium huius libelli. Nunc incipit Prima pars . . .
Incipit: O nobilis imperator vir gloriosus . . .
134rb: Cap. ultimum libelli physonomie in quo comprehenditur tota intentio singulorum capitulorum eiusdem scientie.
135ra: Tunc quinquaginta sex anni mille ducenti currebantur factum fuit istud opus. Liber finitus qui scripsit scribat, semper cum domino vivat.
Explicit liber Michaelis Scotti astrologi domini frederici rome imperatoris et semper augusti, quem librum com-
135rb: pillavit quasi vulgariter ad preces iam dicti imperatoris et non tantum ad sui laudem quantum fecit ad servitium et ad utilitatem scolarium novitiorum qui ex grandi amore sapientie cupiunt de quadrivio adiscere artem astronomie.[1]

Haskins does not mention the following manuscript which gives the last part of *Liber particularis*: Budapest 157, fifteenth century, fols. 66–83, Michael Scot, *De mundi mirabilibus*; Incipit, 'Cum diutissime Federicus imperator Rome et semper augustus . . .'

A fuller account than H, 291 *et seq.* MS Vatican Rossi IX, 111, early fourteenth century, is given by O. Holder-Egger in *Neues Archiv der Gesellschaft für ältere deutsche Geschichtskunde* XXX (1905), 353–4.

[1] A. H. Querfeld, *Michael Scottus und seine Schrift De secretis naturae* (Leipzig diss. 1919), possessed a rotograph of fols. 89r–135r of this MS and printed fols. 118r–122r, as an appendix at pp. 50–9.

# Appendix II

## MICHAEL SCOT AND BIBLIOGRAPHY

Michael Scot was in general a very extensive reader, and his wide acquaintance with books of magic has already been noted. He believed that an astrologer should study hard and keep abreast of the literature on his subject. He cited the *Tacuinius*[1] of Cleopatra—a work no longer extant; Isidore, Bede, and *Imago mundi* as to the waters above the firmament (M, 50va); St Ambrose, both alone and with other authors, concerning the moon (M, 65rb, 86rb); Ptolemy, Alexander, Demetrius, Theodosius, Dorotheus, Iaphar (i.e. Albumasar), Thebith ben Corath, Alfraganus, Empedocles, Euclid, Aristotle, and Averroes[2] as to the celestial sphere and its circles (M, 48ra). But a reference to the *Equatorium* of Campanus (M, 47vb) must be regarded as a later interpolation.

In the third *Distinctio* of *Liber introductorius* on astrological interrogations, the Arabic astrologers, Almansor and Messahala, are cited, also such strange names as Nasic or Rasich (M, 125ra; O, 188r), Druinus and Basginco, which have probably been misspelt by copyists, so that Druinus is the same as Druvius below. Nigidius and Hermes, Ennius and Amphitrion, are authorities on the number of degrees to a sign. Zael of Toledo, Haly the Saracen, Messahala—here called of India (*Indus* should perhaps be *Iudeus* since Messahala was a Jew), Albumasar—now termed a Greek, Mahumat of Syria, Druvius of Persia, Emperinus of Tabbara, Alcabitius, and Ptolemy, 'king of Egypt,' are identified with the authors of the *Book of Nine Judges* (M, 128ra). Such a *Liber novem iudicum* is said to have been sent

[1] This spelling is employed at M, 47vb; at M, 122rb occurs the more usual *tacuinum* (for *taqwīm*: GS II, 71, 343, 1000; *Isis*, X (1928), 489–93).

[2] Of these names, the following are mispelled in the MS: Iafhar . . ., Alfagrani, Eppedocles. Some of these authorities had been cited earlier: (M, 19vb; O, 24vb.)

by the Sultan to Frederick II, and so would have been at Scot's disposal, if received before his death. But only three out of his nine—Zael, Messahala, and Albumasar—are found in the list commonly given in Latin manuscripts of that work, although Haly and Ptolemy are cited later on in some manuscripts.

At the beginning of *Liber particularis* Michael listed as authors 'of this art' of astronomy and astrology Ionaton (Zonitus) and Nemroth or Nimrod, Ptolemy 'who made Almagest and Centiloquium,' Alexander the Great and Alnectanebi (Nectanebus), 'Gafar who later was called Albumassar,' Dorotheus, Tebit ben-chorath, Hermes, Messehalle, Muhameth, Habubacher (i.e. Rasis), Tabari (*or* Tahari?), Aristotle, Alcabitius, Zael, Alphraganus, Abohalli, Macrobius, Isidore, Ballomich, Bascimo—probably to be identified with the Basginco mentioned above—and Haly Elrami (Oc, 1rb).

In *Liber introductorius* Michael had twice cited the Tables of Toledo as the best astronomical Tables (M, 47vb; 122rb), but he now speaks of the Toledan Tables, 'or others better and easier than they, if such ever appear' (Oc, 1rb).

On music Michael cited Guido of Arezzo as well as Boethius (M, 42rb). On the soul, besides the Athenians and the Stoics in general, he named Pythagoras, Socrates, Panfidius, Asclepius, Hippocrates, Galen, Apollonius, Alfarabi, Algazel, Averroes, Aristotle, Architas, and Amphitrion in particular (P, 45ra–vb).

Of the Church Fathers he cites, concerning angels, Augustine, Jerome, Isidore,

> and other doctors of the Roman church, lest we seem ignorant of, and incredulous as to, this science (M, 9va).

The margins of the verso of the illuminated first leaf of the Munich manuscript are filled with representations of volumes, above which are written the names of the author of each: Guido Bonati, Ally Allriaiel, Novem iudicum, Clavichulla Solomonis, Techel, Meschalech (Messahala), Alfaganus (Alfraganus), Aly, Almachē binyi (?), Iaffar Masar (Albumasar) de imbribus (on rain), Doroteus in occulltis, Alchininum compositum, Artem notoriam Alphari, Adam, Idea Floronis (?), Petrus Abadendet (?), Anulorum Solomonis, Clavicula Arlis (of Aristotle), Chait tebonicus (?), Coniuratio angellorum, Thebit bencorath, Vachat (i.e. Liber vacce) Platonis, Alchabitius, Flores Albumasar,

Almagest of Ptolemy, de ymagginibus, Lucidarium in natura, Pietatis Aristo(telis), Consolationis medi., Lucidarium in divinis, Septuagint alchymium (probably a reference to Septuaginta ascribed to Geber), Siyph (?), and the *Centiloquium* of Ptolemy. Of these Guido Bonatti, of the second half of the thirteenth century, was obviously too late to have been read by Michael, but most of the others are either cited by him or were the sort of books, including the magical, that he read.

At the end of the prologue Michael also made some general statements of a bibliographical character. He had just given another list of 'doctors of this art'—Solomon, the sibyl, Tebit ben Chorat, Messahala, Dorotheus, Hermes, Boethius, Averroes, John of Spain (he does not call him of Seville), Isidore, Zael, Alchabitius.

> And because of experiments discovered, compiling books they gave them titles. In which connection it should be understood that the title of any book in this art may be perfect or imperfect. A perfect *titulus* is that which contains the name both of book and of author. . . . An imperfect *titulus* is that which contains only one of them, either the name of the book or of the author, as *Breviarium*, *Psalterium*, *De contemptu mundi*, or Avicenna. For there is a difference between *auctorem* and *actorem*, since *auctor* is he who amplified the work and is derived from *augeo*, *auges* . . . as in the verse
>
> *Ampliat hic auctor; ab agendo dicitur actor.*

Michael adds that *titulus* is derived from Titan, which is the sun, because, as the whole world is illuminated by the sun, so every book is made known to the reading public by its title (M, 19vb; E, 61ra). Neither *auctor* nor *titulus* is considered in the *Etymologies* of Isidore of Seville. But while Michael distinguished author and title, he did not give incipits, as Albertus Magnus was to do in *Speculum astronomiae*.

# Appendix III

## QUESTIONES NICOLAI PERIPATETICI [*sic*]

At fol. 42va of BN 7156 the text opens:

> Quoniam terra sperica est, vapor ascendens de terra spericus erit, si elevetur ex se ex spiritu mediocri et non habente magis ex una parte quam ex alia, et tunc ex congelatione illius vaporis insursum opposita soli contingerit apparere arcule . . .

Of the paragraphs which follow many open, '*Dico . . .*'

By 43va the text is discussing orpiment and sulphur, their unctuosity and sublimation, and it is told how to have roses on Christmas Day.

> Et dico quoniam in cavernis terre contingit esse aquam et illam derivari per meatus ut emergat super terram, sed vero [non?] in maiori altitudine quam fuit eius origo, propter quod si auferimus aquam a puteo, statim cum aqua ascendet in equali elevatione et non in maiori, et quod super cannalem aliquando ascendit in similitudine altitudinis—hec (43vb) est quia origo illius aque fuit tam alta et magis quam cannalis.
>
> Et dico quod quemadmodum contingit crescere aquam putei post ablationem ita quod terram humorosam et limosam contingit crescere, quia si auferatur in aliqua quantitate continuus erit crementum (?) terre in equali quantitate, et hoc est quia humidum quod admiscetur illi terre per minutas particillas elevat illam terram in equali altitudine vero (?) sua origine. et hoc est quare contingit montes crescere iuxta colletum (Toledo?) post ablationem suarum partium.

The text goes on to state that other animals are sometimes generated from a corpse by subtle exhalations from it, and that similarly herbs are generated without roots on the surface of water standing in the heat, that sea water cannot putrefy but that running water may. The motion of humid things is a sign of heat and putrefaction. Rarefaction produces a vacuum, as is

seen in a cupping-glass drawing blood. Bringing a phial of water into contact with wine without their really mixing is thought to affect the taste of the water, so that feverish patients who want to drink wine are satisfied with it. Fol. 44ra proceeds to contend that substances attract that of which they are destitute, but that there is also another attraction of like to like. That which is hot and dry attracts the humid.

Turning in 44rb to sound, our text holds that men with a large windpipe and large *fistula pulmonis* make a horrible sound, whereas mixing tin with copper in bells makes them sound sweeter because of the greater humidity of the tin. Pulverized orpiment and sulphur, put on heated copper, blacken it, because it attracts to itself the humidity which produced their yellow colour.

> And this is also the reason why men, who wish to whiten and purefy (*dealbare et declarare*) orpiment and sulphur, wash them in sharp washes such as urine and vinegar and lye and goat's milk, and extract the unctuousness which made them yellow.

On 44va we learn that the human appetite is in the hot and dry vital spirit which craves the humidity of food and drink, and that a man with a cold stomach suffers continuous diarrhoea. The flame of a candle stays the same because of terrestrial particles in the surrounding air which are too minute to be perceptible to sense. Red wine is more terrestrial than white, evaporates less, and has more inner heat.

Column 45ra is largely physiological. The effect of the vapour from wine is noted, also the small veins in the neck, and Aristotle is cited. Another column (45rb), and we are told that sometimes earthiness from its dryness makes for porousness, that iron is more porous than steel, and so a smith mixes steel with iron. After a digression to the effect that baked meats retain more humidity than boiled meats do (45va), we come back to steel and metals, learning how to soften steel, apparently by evaporating lead, and citing (45vb) *artifices metallorum*. The humidity of quicksilver takes away the dryness of steel; lead and tin mixed are harder than either alone; and instruction is given (46ra) how to reduce lead to a powder.

> And here is a trick which the Saracens play in carrying their gold from land to land under the guise of a leaden earth, and afterwards

putting it in a furnace. The quicksilver will exhale thence without loss of the gold.

An analogy between the vapours and spirits in a man drinking going to his extremities, and sprinkling burning plates of silver in order to make the unctuosity in the silver descend to the bottom of the pot and the silver rise to the surface, is followed by the statement (46rb) that those wishing to make glass without ashes of iron and flint mix lead with fine earth. We are also informed that those wishing to make meat cook faster put bits of glass in the water with it to attract its humidity, and that for this purpose glass made of the ashes of iron and flint is superior.

If sweets are given to a famished man, the sweetness is so attracted by his members that his passages are stopped up. In the same way trees which have been long destitute of moisture draw up so much moisture and gross vapour, when rain does come, that the bottom of the tree is blocked up, and nutriment cannot reach the branches.

On 46va it is added that the heat of the tree should disperse the vapour and rarefy it and turn it into leaves and fruit, 'and then, as it convalesces, this fruit ripens and from lack of nutriment falls off.'

> And this is why certain trees bear fruit often, but this does not happen except in hot regions in which there is great heat every now and then, and light rains . . . and this happens in the land of the Moors.
>
> And I say that quicksilver communicates radically with every metal, but note that lead consolidates tin; and tin, lead. Moreover, this is strange that like cannot adhere to its like, and the discrete parts hold together in its like rather than in its unlike.

The explanation is that dry tin penetrates the gross viscuous humidity of lead and retains it, especially since liquefied tin retains its heat longer than heated lead.

At 46vb the text continues that borax consolidates silver with silver and lead with lead, but not unless it communicates radically with them. Artificers of alchemy use borax. They do not try to transubstantiate copper into silver but only to remove from it the colour which hides the substance of silver. Silver workers mix copper with silver, when they wish to stretch it out

without breaking. Some things are naturally incisive like vinegar and goat's blood; (47ra) some act by violence like the air from bells, which makes fissures in the walls of campaniles. Vinegar extinguishes an inextinguishable flame by separating it into minute particles, and by its frigidity alters and extinguishes that heat, converting it into frigidity. Another method of extinguishing is by sand, the particles of which separate those of the flame, which cannot exhale into the air and have no respiration from it.

An egg soaked in vinegar for three or four days can be squeezed in the hand without its shell breaking. An egg sinks in water mixed with must; otherwise it floats.

(47rb) The heat of ardent wine which threatens to break its keg is quenched or toned down by placing a piece of cheese near it. The cold dry cheese receives within its pores the spirit of that ebullient wine and alters it by its frigidity, and then the wine stops boiling.

But note that heat is extinguished in another way through the resolution of gross humidity or fumosity, as when water is thrown on fire and the fire is extinguished.

But sometimes extinction is made by contraction of fumosity, as when the testicles of a drunken man are put in cold water, cooling the stomach and constricting the matter evaporating to the brain. For drunkenness is nothing else than the fumes from wine obstructing the channels by which the spirits descend from the brain.

In the margin of 47va is a passage describing how *aqua ardens* is made from wine. The text proper asserts that pork fat will not burn, and that wood cut in a moist full moon burns with a grosser flame than that cut in a new moon,[1] and putrefies more quickly. Geese are more tasty when cooked with moist, rather than with dry, wood.

(47vb) Salt, though itself hot and dry, if cast on a fire, extinguishes it, because it receives the particles of flame in its wide pores. Sulphur burns spontaneously. Cow fat will not, because the cow, like all ruminating animals, is of a cold constitution (*complexio*). The reason why bendable objects such as a sword, do not at once regain their rectitude is the gross viscoscity

[1] Here the text in Digby 153, fourteenth century, fols. 168–74v, *Tractatus curiosus de attraccione naturali,* ends: . . . *grossiorem flammam emittit quam ligna decisa in novilunio.* A former owner of the MS says that our text *multum concordat cum sententiis Ursonis in Amphorismis!*

in them. If a rod snaps back straight immediately (48ra), it is because bending it condenses the air in its pores, and it tends to regain its proper consistency. If you cut the rod a bit, while it is bent, the air rushing out will break it completely. Everything rare easily gives way, as Aristotle says, while a dense object offers resistance. Heat causes rarefaction; cold, condensation; as is written in the book *De celo et mundo*. Heat dissolves and is the reason why a little cold in summer harms the body more than a maximum in winter, when the pores are constricted.

(48rb) The notion is accepted that to make cold water coldest, it should be heated in between. 'And I say ash is made glass by rarefaction of its parts.'

(48rb–va) Judging from the relative amounts of humidity in crystal and in air, one would say that air would magnify more, but we see the opposite, since a letter appears broad under crystal, which appears narrowed through the medium of air. Further, the fact that air contains heat, the principle of expansion, would make one expect air to magnify more than crystal, which is cold, the principle of contraction. The explanation is the hardness of crystal which resists, so that the letter does not go straight through but expands sidewise. So the sun seems larger when seen through air which is thick with vapours.

> Et attende quam (?) vitrum est pervium ut cristallus, quod non est de porositate sed de luciditate et de tersitudine. Si enim hoc esset ex porositate, tunc splendor feriens (?) super vitrum pictum, cum in poris non sit pictum, numquam adveniens ad occulum appareret secundum similitudinem picture fenestre, cuius oppositum videmus sepe.
>
> Explicit liber Alpharabii.

Other manuscripts differ from the foregoing text in closing '. . . vinum potatum ab alio,' which the above text fails to reach: see Graz, University of, 482, perg. c. 1300, fols. 173ra–179vb; London, British Museum, Royal 12.C.XV, early thirteenth century, 2-col., fols. 254r–260v; Laon 412, thirteenth–fourteenth century, fols. 9v–14v. But all have the same incipit 'Quoniam terra sperica . . .'

# Appendix IV

## MICHAEL SCOT, *THEORICA PLANETARUM*

(The opening chapter on the sun occurs only in Oc, 89ra–vb, TR 390.)

Incipit theorica omnium planetarum. Et primo de sole. (C)irculus excentricus dicitur uel egresse cuspidis uel egredientis centri qui non habet centrum cum mundo. Pars excentrici circuli que maxime remouetur a centro mundi dicitur aux uel longitudo longior.[1] Et pars que maxime accedit dicitur oppositum augis uel longitudo propior. due loca circuli que sunt in medio inter augem et oppositum augis dicuntur longitudines medie. Mouetur autem sol proprio motu ab occidente in orientem in suo circulo excentrico semper equaliter, quare oportet ut moueatur in orbe signorum inequaliter. Mundus uero rotatur ab oriente in occidentem equaliter. Medius motus solis dicitur arcus zodiaci interiacens lineam exeuntem a centro terre ad locum arietis et lineam exeuntem ab eodem centro ad firmamentum. lineam dico equidistantem linee exeunti a centro excentrici per centrum solis. Verus motus solis dicitur arcus zodiaci interiacens inter caput arietis et lineam exeuntem a (89rb) centro terre per centrum solis. Equacio solis dicitur arcus zodiaci cadens inter medium motum et uerum motum, que equatio nulla est sole existente in auge uel in opposito augis. Existente autem in longitudinibus mediis, maxima est. Argumentum solis dicitur arcus zodiaci cadens inter augem et lineam terminantem medium motum. Aux solis in secunda significatione dicitur arcus zodiaci cadens inter caput arietis et lineam que transit per augem excentrici. In una autem medietate celi maior est medius motus, quare tunc equatio est subtrahenda. In alia minor, quare tunc equatio est addenda. Inuenire autem medium motum solis est inuenire quoddam arcum zodiaci qui sic se habeat ad zodiacum quemadmodum arcus excentrici pertransitus a sole se habet ad excentricum. et hec inuenitur per lineam equidistantem sicut apparet in subiecta figura.

A '*Figura solis*' occupies the lower half of both columns (89ra–b).

[1] For a similar sentence see below the opening paragraph of the other MS.

(89va) (E)piciclus siue orbis reuolutionis uel circulus paruus seu breuis dicitur ille cuius centrum mouetur super circumferentiam excentrici ab occidente ad orientem. Excentricus solis immobilis est nisi quantum ad motum octaue spere. Excentricus lune mouetur cotidie ab oriente ad occidentem xi gradibus fere. Et centrum excentrici describit quendam paruulum circulum circa centrum mundi. Et centrum epicicli mouetur 13 gradibus fere in die ab occidente in orientem. Et centrum solis mouetur fere uno gradu in die contra firmamentum. Vnde apparet quod si centrum solis et aux excentrici et epiciclus lune essent per aliquam horam in aliquo loco celi, in sequenti die sol distabit ab eodem loco per gradum unum et aux per xi, et centrum epicicli lune per 13, quare tunc sol erit in medio scilicet inter augem et centrum epicicli. Quare si dupletur distancia inter augem et centrum epicicli, hec distancia dicitur centrum lune uel duplex intersticium epicicli lune. Et ex hoc manifestum est quod ista tria aut sunt in eodem loco, aut sol recte est in medio duorum aut in opposito eorum. Patet etiam quod centrum epicicli bis transit excentricum in mense, et in coniunctione cum sole est in auge et in oppositione. Similiter in quadratis autem id est quando luna est ditotomos, est in longitudine priori. Luna uero mouetur in circumferencia epicicli cum est in superiori parte ab oriente ad occidentem, quare tunc est tarda in cursu et econtro cum est in inferiori, quare tunc est velox. Alii uero planete faciunt econtro. Sicut autem sol equaliter mouetur super centro excentrici sui, sic et centrum epicicli lune mouetur equaliter super centrum mundi. Medius motus lune est arcus zodiaci incipiens ab ariete consideratus secundum successionem signorum, scilicet arietis tauri etc, cuius medius motus terminatur in linea exeunte a centro terre per centrum epicicli.

Verus locus lune terminatur per lineam exeuntem a centro mundi per centrum corporis lune. Aux media in epiciclo dicitur punctus quem terminat (89vb) linea exiens a quodam puncto centro excentrici lune qui tantum distat a centro terre quantum centrum excentrici, exiens dico per centrum epicicli ad superiorem partem epicicli. Aux uera dicitur punctus epicicli quem terminat linea exiens a centro mundi per centrum epicicli ad superiorem partem. Equatio centri dicitur arcus parvulus epicicli interiacens augem mediam[1] et centrum lune consideratus secundum modum[2] lune in epiciclo.

Argumentum verum dicitur arcus interiacens augem veram et centrum lune. Centro uero epicicli existente in auge excentrici quod est in coniunctione uel in oppositione media et existente in opposito augis quod est in quadratis lune ad solem nulla est equatio centri, id est, aux uera et media sunt idem. Equatio argumenti lune dicitur arcus zodiaci interiacens medium motum et uerum, quare equatio nulla est centro epicicli existente in auge uel in opposito augis excentrici, et cum hoc est, luna existit in longitudine propiori aut

[1] Here the editions ascribed to Gerard of Cremona add: 'et veram. Argumentum medium lune dicitur arcus epicycli interiacens augem mediam.'
[2] *Motum* in Gerard of Cremona

longiori sui epicicli. Maior uero motus est centro epicicli existente in longitudinibus mediis excentrici quam luna existente in longitudinibus mediis epicicli. Et dum luna fuerit in medietate epicicli que respicit orientem, maior est medius motus quam verus, quare tunc equatio argumenti est subtrahenda. In reliqua uero medietate contingit econtro. Et est sciendum quod maiores sunt equationes argumenti centro epicicli existente in oppositioni augis excentrici quam in auge. Et differentia que est inter has equationes argumenti centro epicicli existente in auge uel existente in opposito augis dicitur equatio diversitatis dyametri circuli breuis sui epicicli. Equationes argumenti que scribuntur in tabula sunt equatores ac si centrum epicicli esset semper in auge. Centro epicicli existente in aliis locis excentrici crescunt equationes argumenti secundum quod centrum epicicli accedit centro terre. Et ista argumenta equationum sumuntur per minuta proportionalia que minuta proportionalia dicuntur 160 particule linee existentis inter centrum terre et centrum excentrici diuise in 60 partes. Linea uero que dirigitur a centro terre ad oppositum augis nullem habet de istis particulis siue partibus. Que uero dirigitur ad augem, omnes habet partes. Alie uero que diriguntur ad alia loca habent de illis partibus secundum accessum et recessum ab auge in oppositum augis, ut patet in subiecta figura.

A '*Figura lune*' occupies much of 90ra–b.

Meanwhile in V, 90ra, the text has opened:

Theorica planetarum est scientia utilis omni astrologo qui laborare intendit circa equationem et recte cognoscere de motibus eorum, nec umquam quis erit bonus equator nisi habuit bene per manus hunc tractatum qui dicitur theorica planetarum. De quo hic talia sunt extracta.

Omnibus quidem planetis dicitur esse distancia centrorum epiciclorum suorum ab augibus suis. Tamen dicitur quod in luna est duplex longitudo. Vocatur autem aux planete illa augmentacio ubi magis excentricus eius, id est circulus eius, recedit a centro terre. Et est sciendum quod excentricus[1] lune declinat a uia solis in duas partes videlicet ad septentrionem et ad[2] meridiem et intersecat excentricum solis in duobus locis sibi[3] oppositis[4]

[1] Here Oc, 90ra, resumes, with the heading, '*De capite draconis,*' and the text '*xcentricus lune declinat a uia solis . . .*'
[2] Oc omits *ad*.
[3] Oc, '*semper sibi*'
[4] The text which immediately follows is presented in double columns for the two MSS. The word *gehuzaar* and the number 180 do not appear in either of the editions of 1478 in the Pierpont Morgan Library: either that printed with the *Sphere* of Sacrobosco at Venice by Franciscus Renner 'de Hailbrun' (E.23.A.2), or that emended by Petrus Bonus Avogarius of Ferrara and printed by Adam de Rottweil (E.15.A.).

V, 90ra

et iste intersectiones seu divisiones uno modo dicuntur *gehuzaar* et altero modo dicuntur capud draconis et cauda. Caput uero draconis dicitur esse in puncto arietis continens puncta seu gradus 180. Cauda uero est in puncto libre siue in aduersa parte. Vnde tot gradus sunt in inferiori parte quot sunt in superiori id est in augmento et diminutione lune 180. Quod autem dicitur de ariete et libra idem intelligendum est de reliquis signis, videlicet quando luna renovatur in uno, enim mediatur in illo (?) spatio 180 graduum.

Dicitur autem caput draconis sectio duarum circumferentiarum in qua luna incipit declinare ad septentrionem. Cauda uero dicitur consimilis sectio seu diuisio in aduersa parte.

Vterque autem punctus sectionis dicitur *gehuzaar* id est transitus obviationis et coniunctionis duarum circumferenciarum siue duorum circulorum a linea epicicli id est arcus solis. Iste quidem sectiones cotidie mouentur ab

Oc, 90ra

Et iste intersectiones

dicuntur caput draconis et cauda.

Et dicitur caput intersectio duarum circumferenciarum in qua luna incipit declinare ad septentrionem. Cauda uero est consimilis intersecatio in aduersa parte.

Iste enim intersectiones cotidie mouentur ab

oriente in occidentem tribus minutiis fere. Et ducit istas intersectiones[1] quidam circulus concentricus[2] mundo existens in celo lune equalis[3] excentrico in (Oc, 90rb) magnitudine, et est in superficia orbis signorum siue in superficie uie solis.[4] Et[5] iste motus est dissimilis motui planetarum qui est ab occidente in orientem.[6] Et ut habeatur similitudo in motibus[7] dicitur caput[8] tantum ire

[1] V, *et istas intersectiones ducit*
[2] V omits *concentricus.*
[3] V, *equalia*
[4] V adds: '*tantum descendens quantum ascendit supra terram et infra sciendo quod.*'
[5] V omits *Et.*
[6] Oc, *oriente*
[7] V adds *differentialiter.*
[8] V adds *draconis.*

medio motu contra firmamentum quantum in rei ueritate uadit in firmamenti. Et propter hoc subtracto medio cursu capitis draconis a 12 signis remanet locus[1] computatus secundum successionem signorum zodiaci sicut hic[2] patet in subiecta figura.

For the remaining chapters only the title and opening and closing words will be given, indicating the two manuscripts in parallel columns.

| V, 90rb (beneath the figure) | Oc, 90vb (beneath the figure) |
|---|---|
| Sequitur de tribus planetis superioribus scilicet saturno joue et marte Vnde notandum est quod quilibet planeta trium planetarum superiorum habet duos excentricos dispositos in eadem plana superficie . . . | De saturno ioue et marte Sequitur de tribus planetis superioribus scilicet saturno ioue et marte. Vnde notandum est quod quilibet trium planetarum superiorum habet duos excentricos dispositos in eadem plana superficie. |
| 90vb . . . Quanto enim ut dictum est epicicli plus appropinquat centro terre, tanto plus maioratur equacio argumenti ut in hac patet subuecta figura. [The figure fills all of 91r.] | 91rv . . . Quanto enim ut dictum est centrum epicicli plus appropinquat centro terre, tanto plus maioratur equacio argumenti. |
| 91va Sequitur de uenere et mercurio. Nam uenus et mercurius in spera uniuersali duos habent excentricos id est uterque ipsorum duos habet excentricos unius quantitatis . . . | 91va (beneath the figure) (S)Equitur de uenere et mercurio. Nam uenus et mercurius duos habent excentricos id est uterque ipsorum duos habet excentricos unius quantitatis . . . |
| 92rb . . . et de hoc motu dicendum est in latitudinibus. Omnia autem alia de uenere similia sunt tribus superioribus. Et ut hec melius intelligi ualeant, eorum que diximus de uenere et mercurio hic in figura notificantur. | 92vb . . . et de hoc motu dicemus in latitudinibus. Omnia alia de uenere similia sunt tribus superioribus. |
| [92v is entirely filled by a figure.] | [93ra–b A figure fills most of the page.] |
| V, 93ra | Oc, 93ra |

[1] V, *locus remanet*

[2] V omits *hic*.

Sequitur tractatus de directione et retrogradatione planetarum. Ad quod sciendum est quod omnis planeta vel est directus in celo aut retrogradus aut uelox aut tardus . . .

Equitur de directione et retrogradatione planetarum 7. Ad quod sciendum est quod planeta dicitur esse directus quando motus eius iuuatur motu epicicli . .

93va . . . et hoc probatur in spera quia zodiacus elevatur a puncto arietis uersus cancrum tardius, ut predictum est, in prima quadrata quam in 2a eundo ad libram

93va . . . Nam tantus est arcus abc quantus est arcus acb, ut sufficenter patet de omnibus predictis in presenti figura. [This passage occurred earlier in V.]

93va De medio motu planetarum secundum secundum tabulas tolletanas.
Medius motus cuiuslibet planete ad tempus preteritum quod non scribitur in tabula sic accipiatur . . .

93va Medius motus cuiuslibet planete ad tempus preteritum quod non scribitur in tabula sic accipiatur . . .

93vb . . . Nam omnis equacio planetarum intelligitur et est ad rectum meridiem omni tempore, quod totum notatur in presenti figuratione rotarum.
Latitudo planete dicitur distancia ipsius a uia solis. Declinatio planete dicitur distancia ipsius ab equinoctiali circulo . . .

93vb . . . Et secundum situm equacionis quia medium mundi existit. (94ra) Quod totum notatur in precedenti figura.

Latitudo planete dicitur distancia ipsius a uia solis. Declinacio dicitur distancia ipsius ab equinoctiali . . .

94rb . . . nec in circulo altitudinis note. Explicit recollectio rationum de tractatu theorice planetarum per opinionem Mychahelis scoti, et deficit hic de hoc capitulo propter defectum exemplaris.[1]

95ra . . . nec in circulo altitudinis note. [Continued below.]

In Oc the text continues:

Est etiam aliquando maior (95rb) propter unam de duabus causis uel propter ambas. Sunt due cause propter quas reflexio est maior et minor similiter. Una est quando magis distat a nostro zenith.

[1] This passage and that which follows in Oc are not found in the editions mentioned in footnote 4, page 134, which conclude with paragraphs opening, '*Compositores tabularum . . .*' and '*Aspectus planetarum . . .*'

Unde iuxta orizontem est maxima reflexio. alia est quando propinquior est terre. Vnde quando luna est in longitudine propinquior et iuxta orizontem, aggregantur de reflexione gradus unus et minuta 44 que est omnium reflexionum maxima. Quando uero est in longitudine longiori aggregatus 54 minuta. In horis autem ecclipsium quod magis aggregatus de reflexione est unus gradus et 4 minuta. Hic uero motus circa medium anni collocatus ut quasi equaliter procedat, quia in tam paucis annis non est magna inequalitas.

# Index

psychology; of the universe and meteorology; of medicine, metaphysics and magic. Astrology was the supreme science in the thirteenth century, the fundamental natural law almost to the time of Newton being the subjection of inferior elementary bodies to the rule of the stars. Particular emphasis has therefore been placed on the extent to which Michael believed in astrology.

The whole study is based on an intensive survey of manuscript material hitherto unobtainable, and offers many new conclusions.

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