The Younger Avestan people appear accordingly philo-progenitive, energetic and purposeful, confident that they, as followers of Zoroaster, had a divinely appointed part to play in improving the world, and that they were supported in it by *x'aranah* (see FARR), the heaven-sent power that made them superior to all other peoples (cf. *Yt.* 19.56; *Vd.* 19.39).

Bibliography: Given in the text.

(M. BOYCE)

AVICENNA, the Latin form of the name of the celebrated philosopher and physician of the Islamic world, Abū 'Alī Ḥosayn Ebn Sīnā (b. Bukhara 370/980[?], d. Hamadān 428/1037).

i. *Introductory note.*
ii. *Biography.*
iii. *Logic.*
iv. *Metaphysics.*
v. *Mysticism.*
vi. *Psychology.*
vii. *Practical sciences.*
viii. *Mathematics and physical sciences.*
ix. *Music.*
x. *Medicine and biology.*
xi. *Persian works.*
xii. *The impact of Avicenna's philosophical works on the West.*
xiii. *The influence of Avicenna on medical studies in the West.*

i. INTRODUCTION

The generally accepted view that the Islamic philosophic tradition established by Fārābī (d. 339/950) came to an end with Ebn Rošd (Averroes, fl. 520-95/1126-98) has been challenged by scholars who have pointed to the continuity of that tradition in the East, principally in Iran, to the present day. In order to understand the point at issue, one must begin with Avicenna, as a disciple of Fārābī, which in many ways he was, but also as a thinker who attempted to redefine the course of Islamic philosophy and channel it into new directions. For to the extent that the post-Averroistic tradition remained philosophic, it moved in the directions charted for it by Avicenna in the investigation of both theoretical and practical sciences.

If one looks at the broad movement of Islamic philosophy since Fārābī one can see that it began with the formulation of its principles and moved progressively toward greater elaboration and application of these principles to the study of the relation between philosophy and religion, but also toward a closer and more detailed examination of the various aspects of the phenomenon of religion, such as prophecy, revelation, the divine or religious law, and of what one might call the varieties of religious experience. Fārābī avoided explicit examination of Islam or any other particular religion and always spoke of religion in general. (As far

as the reader is concerned, he could have been speaking about someone else's religion or some hypothetical religion.) This enabled him to speak boldly, if cautiously, about the relation between philosophy and religion, state the principles of a philosophic or scientific approach to the study of religion, include the science of religion within political philosophy, and identify religion with the city.

With Avicenna one finds the beginnings of a movement away from explicitness about the central question of the relation between philosophy and religion, and toward treating this question either in the form of myths, poems, and stories, or else obliquely by means of suggestive hints. Instead, there emerges what might be called a philosophic interpretation of religion: The various aspects of the phenomenon of religion in general, and of Islam in particular, are explained in a way that, broadly speaking, bears out Fārābī's view of religion, but without stating the original formulation of that view or its political framework. The Koran, the Tradition of Moḥammad (*Sonna*), the political history of the Muslim Community (*Omma*), the Islamic Law (*Šarīʿa*), Islamic theology (*kalām*), and such questions as prophecy and revelation are now examined directly, not as a hypothetical case, or as the "universals" or "general rules," as was the case in Fārābī's political science, but as this specifically determined revelation and as these doctrines and texts and men and situations. This required him to make certain concessions, especially in areas such as the resurrection of the body, where reason can not validate religious doctrine. But it enabled him to domesticate philosophy in the Islamic world and present it in a way that could now be appreciated, not only by the select few, but by a wide range of educated Muslims.

Two generations after Avicenna, Abū Ḥāmed Ḡazālī (fl. 450-505/1058-1111) testifies to the fact that no serious Muslim thinker could ignore the claim of philosophy as a way to the highest and most comprehensive knowledge available to man and as a way to the Truth. He also testifies to the fact that, at least as far as he was concerned, philosophy for all practical purposes meant Avicenna's philosophy. When he set about to learn what philosophy was, he read Avicenna's works. When he tried to present the intentions of the philosophers, he wrote a summary of Avicenna's philosophy. And when he tried to show the incoherence of the philosophers, he wrote a refutation of Avicenna's doctrines. Similarly, when Moḥammad Šahrestānī (d. 548/1153) came to give an account of the doctrines of "the philosophers of Islam" (*falāsefat al-Eslām*), as distinguished from the doctrines of Greek or Indian philosophers, he simply summarized the doctrines of "the most distinguished ... Avicenna" (ed. A. Fahmī Moḥammad, 3 vols., Cairo, 1368/1949, 3.3, 3.43). Most of the later Muslim theologians and mystics who tried to harmonize philosophy and theology, or philosophy and mysticism, and, later on, philosophy and theology and mysticism, also made use of Avicenna. All this testifies to his success in popularizing philosophy in the

Islamic community. Later philosophers, especially in the Islamic West, perceived that Avicenna's success was achieved at the expense of the integrity and purity of philosophy, by concessions to theology and mysticism, and by the creation of a hybrid mixture which led to confusion and exposed philosophy to attacks and criticisms by men like Ġazālī. Within philosophic circles, there arose an anti-Avicennan, pro-Farabian tradition which accused Avicenna of engaging in too much rhetoric and dialectic and of making too many adjustments to popular views. His popularity with non-philosophers was matched, among his fellow philosophers, by a certain opposition to his temper, manner of writing, and lack of prudence. But the public did not, of course, listen to these philosophers. Avicenna's writings spread like fire and continued until today to form the basis of philosophic education in the Islamic world.

However all this may be, the central question is how Avicenna took the crucial step or steps from Fārābī's general science of religion to a science of this particular religion which is Islam. Avicenna wrote a vast body of specialized tracts on religious matters, including commentaries on Koranic passages, and discussions of subjects like prayer, prophecy, and the hereafter. Most of these, however, represent a movement from particular religious doctrines and ideas to their theoretical principles, without explaining the place of these specialized discussions within the whole body of human knowledge. And he wrote encyclopedic works on logic, natural sciences, mathematics, and metaphysics, in which practical science occupies a subordinate position.

(M. MAHDI)

ii. BIOGRAPHY

Sources. Avicenna's biography presents the paradox that although more material is available for its study than is average for a Muslim scholar of his caliber, it has received little critical attention. The very existence of the autobiography and Jūzjānī's biography, both retold, paraphrased, and elaborated upon, seems to have inhibited from the very beginning further research into additional sources and critical analysis of those available. The assessment first made by Ebn Abī Oṣaybeʿa in the middle of the 7th/13th century has been valid ever since for both Muslim and Western scholars: Avicenna "mentioned his personal circumstances and described his own life in a way that relieves others of describing it again" (*Ketāb ʿoyūn al-anbāʾ fī ṭabaqāt al-aṭebbāʾ*, ed. A. Müller, Cairo, 1882-84, II, p. 2).

A comprehensive and critical study of Avicenna's life will have to draw on the following four categories of sources:

1. The autobiography/biography complex and its recensions and derivatives. Avicenna's autobiography covers the period from his birth until after his encounter with Abū ʿObayd ʿAbd-al-Wāḥed Jūzjānī, his disciple and constant companion. Jūzjānī wrote down the autobiography (either from dictation, according to Ebn

al-Qefṭī, *Tārīk al-ḥokamāʾ*, ed. J. Lippert, Leipzig, 1903, p. 413, or from a draft originally penned by Avicenna), and appended to it the biography, covering the rest of Avicenna's life. This combined original document, in Arabic, exists in at least two recensions. One is embedded in the accounts of Avicenna by Ebn al-Qefṭī (pp. 413-26) and Ebn Abī Oṣaybeʿa (II, pp. 2-9), and the other exists independently in various manuscripts, in some of which it is also given the Persian title, *Sargoḏašt*. The relationship of the two recensions to Jūzjānī's text and to each other is not entirely clear. W. E. Gohlman, the editor of the *Sargoḏašt*, tends to think that it is closer to the original (Gohlman, *The Life of Ibn Sina*, p. 6).

Jūzjānī's edition of the autobiography/biography forms the only source for all subsequently narrative accounts of Avicenna's life. There is no indication that there ever was an original rival biography, and all later retellings merely repeat Jūzjānī's account in different degrees of fidelity to his (and Avicenna's) wording. These retellings differ only in the various details they introduce, which, however, have to be proven authentic in each case before they can be accepted. Even during his lifetime Avicenna had achieved great fame or notoriety (depending on the viewer's standpoint), and stories about him with essentially hagiographic or demonographic content doubtless began to circulate soon after his death. The trend continued until later popular tradition made of him either a saint and a mystic or a magician.

The most important retelling of the auto-biography/biography, which sometimes is erroneously treated as an independent source, is that by Ẓahīr-al-dīn Abuʾl-Ḥasan Bayhaqī in the *Tatemmat ṣewān al-ḥekma*. Bayhaqī recasts the autobiography in the third person, slightly paraphrases the biography, omits certain details, mostly of a bibliographic nature, and adds some others. These additions, which in Šafīʿ's, edition (Lahore, 1935) are conveniently enclosed in double brackets, occur mostly in the autobiography part, and are informative (provide names of personalities mentioned, refer to historical events), bibliographic (report on the fate of some of Avicenna's lost books), calumniatory (blame Avicenna for being the first philosopher to indulge in wine and sex, and to frequent royal courts), and anecdotal (e.g., the story of ʿAlāʾ-al-dawla's sister and the Ghaznavid Sultan Masʿūd, pp. 55-56 and Avicenna and the youth from Ray, pp. 59-61). Except for the bibliographic reports about the survival of some of Avicenna's books, not much of this additional information can be taken at face value. Bayhaqī's gratuitous comments on Avicenna's alleged debauchery, his arbitrary extrapolations from the material at hand, such as the mention that Avicenna used to study the *Rasāʾel Ekwān al-Ṣafāʾ*, and the anecdotal material merit little credence; but even the information about the names of certain personalities should be questioned. There is no reason why the names of Avicenna's mother, and of the greengrocer from whom Avicenna learned arithmetic as a young boy, should have survived unaltered, or at all, for more than

150 years until Bayhaqī's time. Such information, even if it had survived orally in the popular tradition, lends itself easily to falsification.

Similar criticism must be applied to all details added in the derivatives of Jūzjānī's edition of the autobiography/biography. These derivatives are the accounts of Avicenna's life by subsequent biographers, from Ebn Kallekān (*Wafayāt al-aʿyān*) and Šahrazūrī (*Nozhat al-arwāḥ*) to Ebn al-ʿEmād (*Šaḏarāt al-ḏahab*) and Kʿāndamīr (*Ḥabīb al-sīar* and *Dostūr al-wozarāʾ*).

The manuscript tradition of Jūzjānī's edition also shows accretions and contaminations from various sources. In one instance, the recension in Ebn al-Qefṭī/Ebn Abī Oṣaybeʿa is contaminated with the version of Bayhaqī, in the Vienna MS Ar. Mixt. 866, 8 (H. Loebenstein, *Katalog der arabischen Handschriften der österreichischen Nationalbibliothek*, Vienna, 1970, p. 212, no. 2430).

2. Private writings by Avicenna and his disciples. These constitute a reliable source about numerous details of Avicenna's life. They consist of his many autobiographical references in the prologues, epilogues, and occasionally even in the body of his own works, of his correspondence, and of similar writings by his disciples, including Jūzjānī's introduction to the *Šefāʾ* (*Madḵal*, Cairo, 1952, pp. 1-4). This material, which has been virtually untapped for Avicenna's life, is preserved partly in the collection of his *Nachlass* known under the title *al-Mobāḥaṯāt*, one recension of which was edited by ʿA. Badawī, (*Aresṭū ʿend al-ʿArab*, Cairo, 1947, pp. 119-249), and partly independently in the MSS, and remains mostly unpublished.

3. Historical works. As a rule they have little information to add to Avicenna's life, but they are useful for providing the background for many of the social and political events referred to or hinted at in the autobiography/biography.

4. Legendary and hagiographic stories. These belong not to his biography proper but to a study of the transformation of his image in popular tradition after his death. This played a role in the reception of his authentic works in the Persian- and Turkish-speaking areas of the Islamic world and has to be studied as a separate subject. The pride of place among the legendary material belongs to Neẓāmī ʿArūżī's *Čahār maqāla* (tr. E. G. Browne, London, index, s.v.). For later material see A. Süheyl Ünver, "Şark folklorun'da İbni Sina hakkında yaşayan ve kaybolan efsaneler," in his *İbni Sina, Hayatı ve Eserleri Hakkında Çalışmalar*, Istanbul, 1955, pp. 62-70.

Analysis of the autobiography. For the fiıst part of Avicenna's life, our sole source of information is the autobiography. The real purpose of this document is philosophical: While purporting to give details about his early life—details which, in the absence of contrary, or any other, evidence, may have to be taken at face value—Avicenna is providing a concrete illustration of his epistemological theory. This centers on the ability of some individuals with powerful souls to acquire intelligible knowledge all by themselves and without the help

of a teacher through their propensity to hit spontaneously upon the middle terms of syllogisms, *ḥads* (see below Mysticism: Avicenna and Sufism). The autobiography is written from the perspective of a philosopher who does not belong by training to any school of thought and is therefore not beholden to defending it blindly, who established truth through his independent verification (*ḥads*) and found that for the most part this truth is contained in the philosophical sciences as classified and transmitted in the Aristotelian tradition, and who is therefore in a position both to teach this more accurate version of truth—or revised Aristotelian philosophy—and to judge the attainment in philosophy of others.

For this reason, when the autobiography is reduced to its bare essentials, it appears as a transcript of Aristotelian studies and a model curriculum vitae in a Peripatetic program. Avicenna reports in it basically that he studied the philosophical sciences according to their classification in the Aristotelian tradition, and that he studied them in three successive stages at increasingly advanced levels. Everything else that Avicenna says he studied was studied not for its own sake but for that of the philosophical sciences, in whose terms it is to be seen. The elementary courses in the Koran, literature, and arithmetic are preparatory subjects for the philosophical sciences. Avicenna's rejection of the Ismaʿili teachings is intended to indicate that already at an early age he could refuse, through his own reflection, authoritative knowledge, *taqlīd*. (Bayhaqī's unwarranted addition at this point, that Avicenna would read and reflect on the *Rasāʾel*, as already mentioned, caused many a misunderstanding and generated the myth of the Ismaʿili Avicenna. Avicenna nowhere indicates that he had any interest in the doctrine or in the kind of thinking it involved.) His study of *feqh* with the Hanafite jurist Esmāʿīl Zāhed (d. 402/1012) is mentioned only to refer to the method of the discipline and to justify his knowledge of and practice in Aristotelian dialectics (as expounded in the *Topics* 8). On this basis is Avicenna then able to analyze the question "What is it?" and amaze his teacher Nāteli. Medicine, finally, though it belongs to the canon of sciences in the Greek Aristotelian tradition, is not a theoretical, but a practical science. Therefore it is easy, i.e., its acquisition does not require the solution of syllogisms by hitting upon middle terms, but merely reading the texts and medical practice. Avicenna then says that he studied the philosophical sciences—logic, mathematics, physics, metaphysics, in that order—in three stages: first, initially with Nāteli and finally on his own, second, entirely on his own, and third, at a research level, in the physicians' library in the palace of the Samanid ruler.

The systematic nature of Avicenna's presentation of the actual course of his studies, and its close correspondence to the theoretical classification of the philosophical sciences, raise the question whether Avicenna presented a stylized autobiography in which the chronology of events is bent to fit the theoretical classification of the sciences. The issue can not be resolved,

insofar as the classification of the sciences in the Aristotelian tradition influenced actual educational practice which in turn is presented in an autobiographical account reproducing that very classification in order to promote it. However, the exact historical sequence of events in Avicenna's studies is not as important as the point which the autobiography intends to make, as discussed in the first paragraph of this section.

Avicenna's life. Bukhara (370/980[?]-389/999[?]). Avicenna was born around the year 370/980 and most likely quite a few years earlier than that. It has not yet been possible to establish the date of his birth with greater precision; there are enough inconsistencies and contradictions in the transmitted chronology, however, to make the traditional date of 370/980 rather untenable (Sellheim, *Oriens*, p. 238). He was born in Afšana, a village near Bukhara. His father, who had moved in from Balk a few years previously, was the Samanid governor of nearby Karmaytan. A few years after his birth, the family moved to Bukhara. The intellectually active capital attracted scholars, and Avicenna had an excellent education. Although for the reasons mentioned in the preceding section Avicenna is reticent about his teachers, it is almost certain the he studied with more scholars than the Nāteli that he mentions in the autobiography; the names of the physicians Abū Manṣūr Qomrī and Abū Sahl Masīhī are also mentioned among his teachers. Given the availability of teachers and libraries, his father's high position in the Samanid administration, and his own application and precocity, Avicenna was perfectly schooled in the Greek sciences by the time he was eighteen.

Avicenna began his professional career around the age of seventeen, when he was enrolled as a physician in the service of the Samanid Nūḥ b. Manṣūr (r. 365/976-387/997) whom he was summoned to treat. After the death of his father a few years later—according to the chronological sequence of the events as described in the autobiography, after he was twenty-one—he was also given an administrative post, perhaps a district governorship. The fact that in the autobiography the death of his father and his assumption of administrative duties are mentioned closely together justifies the speculation that he may have succeeded his father as governor of Karmaytan. By a relatively early age Avicenna was established, in his twin capacity as physician and political administrator, in a profession that he was to practice in the courts of various Iranian rulers, heads of the numerous successor states that emerged during the period of the disintegration of 'Abbasid authority.

Gorgānj (ca. 389/999[?]-402/1012). Avicenna remained in Bukhara until, as he puts it, "necessity called" him to leave for Gorgānj in Kᵛārazm, where he joined the service of the Ma'munid Abu'l-Ḥasan 'Alī b. Ma'mūn (see Āl-e Ma'mūn). Since the latter reigned from 387/997 to 399/1009, Avicenna could have moved to Gorgānj any time between these two dates; but the fact that the "necessity" to which he refers can be interpreted in any satisfactory way only in political

terms suggests the following. The Samanid state was overthrown by the Turkish Qarakhanids who entered Bukhara in 389/999 and took 'Abd-al-Malek II, the last amir, prisoner. Avicenna, a high functionary of the fallen state and strongly identified with the Samanid dynasty, may have found his position, to say nothing of his job, difficult to maintain. Furthermore, it may not be entirely fortuitous that soon after the fall of Bukhara to the Qarakhanids, Esmā'īl Montaṣer, the Samanid prince, also went to Kᵛārazm to seek support for a political comeback. Avicenna may or may not have been involved in the undertaking, but it appears that it was the events of 389/999 and those immediately following them that generated the circumstances which made Avicenna's departure from his home town necessary (cf. Lüling, "Ein anderer Avicenna," p. 499).

From Gorgānj to Jorjān (402/1012-403/1013). Avicenna left Gorgānj for the same unspecified reason—"necessity called" him—and traveled south into Khorasan and then west. During the journey he passed through Nasā, Abīvard, Ṭūs, Samangān, Jājarm, and arrived at Jorjān (Gorgān) only to find that the Ziyarid amir Qābūs b. Vošmgīr, his prospective patron, had died in the meantime (winter months of 403/January-March, 1013). Avicenna's report in the autobiography is too brief to provide any hints about the reasons behind this odyssey, although political considerations would again seem to be the only plausible answer. As for the duration of his travels, Avicenna does not mention that he stayed or worked in any of these locations, so in all likelihood he left Gorgānj in 402/1012. In Jorjān (403/1013-ca. 404/1014) Avicenna met Jūzjānī. He spent little time there, apparently in the employ of Manūčehr b. Qābūs, and lived in the house of a private patron.

Ray (ca. 404/1014-405/1015). From Jorjān Avicenna moved to Ray, where he joined the service of the Buyid Majd-al-dawla Rostam and his mother Sayyeda, the power behind the throne. Although he had with him letters of recommendation for his new employers, it appears that he gained access to the political elite of the Jebāl again through his skill as a physician. He treated Majd-al-dawla who was suffering from a black bile disease.

Hamadān (405/1015-ca. 415/1024). Avicenna remained in Ray until the Buyid Šams-al-dawla, Majd-al-dawla's brother, attacked the city after Du'l-qa'da, 405/April, 1015. Then he left for Qazvīn, again for reasons unspecified, and finally arrived in Hamadān where he was summoned to treat Šams-al-dawla. Inevitably Avicenna became also Šams-al-dawla's vizier and acted in this capacity (with an occasional conflict with the amir's troops) until the latter's death in 412/1021. The new amir, Samā'-al-dawla, asked Avicenna to stay on as vizier, but "Avicenna saw fit not to remain in the same state nor to resume the same duties, and trusted that the prudent thing to do ... would be to hide in anticipation of an opportunity to leave that region" (Jūzjānī, *Šefā'*, *Madkal*, p. 2). He secretly corresponded with the Kakuyid 'Alā'-al-dawla in Isfahan about this

matter. The Buyid court in Hamadān, and especially Tāj-al-molk, the Kurdish vizier, suspected Avicenna of treachery because of these moves, and they arrested and imprisoned him in a castle outside of Hamadān called Fardajān. Avicenna remained in prison for four months until 'Alā'-al-dawla marched toward Hamadān and ended Samā'-al-dawla's rule there (414/1023). Released from prison in the wake of these developments, Avicenna was again offered an administrative position in Hamadān, but he declined. Some time later he decided to move to Isfahan and he left Hamadān with his brother, Jūzjānī, and two slaves, dressed like Sufis.

Isfahan (ca. 415/1024-428/1037). 'Alā'-al-dawla received Avicenna with honors, and gave him, in Jūzjānī's words, "the respect and esteem which someone like him deserved." Avicenna finally settled in Isfahan and remained in 'Alā'-al-dawla's employ until his death. He accompanied his master in most of his campaigns and trips, and indeed it was during one such trip to Hamadān that he died, in 428/1037, of colic, after a protracted series of recoveries and relapses. He was buried in Hamadān.

Apart from his scholarly persona, which is one of unprecedented energy and sharpness, we get almost no glimpse of Avicenna's character. He was a self-conscious boy prodigy, professionally successful at an early age; also at an early age he became a permanent exile from a home that ceased to exist; he was forced to serve petty rulers most of whom not only did not appreciate his special genius but did not even esteem him as an intellectual; and yet he somehow stayed with these rulers and seems to have been determined to avoid, for whatever reasons, the Ghaznavid court. The combination of these factors, among many others, could produce either a hero or a villain: it does not help to speculate before all the available evidence, especially his private writings, is assessed. One thing, though, is certain, and this has again to do with his scholarly self: When it came to intellectual matters, Avicenna could accept no rival and decline no challenge. When he was slighted for his ignorance of Arabic lexicography, he answered the affront by memorizing Azharī's *Tahḏīb al-loġa*, forging three epistles in the styles of famed authors, and submitting them for identification to the person who had insulted him. That person failed to recognize the forgery. This also, however, depending on the surrounding circumstances, which we do not know, could be interpreted either as extreme arrogance, or proper estimation of self worth, or even as an exaggerated sense of humor. Avicenna the person is hardly distinguishable behind the brilliance of Avicenna the mind. But for Avicenna, who saw the supreme happiness in the contact of the human intellect with the active intellect during the split-second of hitting upon the middle term, perhaps this is just the way it should be.

Bibliography: The only critical edition of the Arabic autobiography/biography in the independent recension (*Sargoḏašt*) is that by W. E. Gohlman, *The Life of Ibn Sina*, Albany, N.Y., 1974. This edition, which contains a facing English translation, has to be used in conjunction with the review by M. Ullmann in *Der Islam* 52, 1975, pp. 148-51. Among scholarly translations, the earliest, and one of the most accurate, is that by P. Kraus, "Eine arabische Biographie Avicennas," *Klinische Wochenschrift* 11, 1932, pp. 1880b-1882b. The very readable, but not always as accurate, English translation by A. J. Arberry was first published in his *Avicenna on Theology*, London, 1951, pp. 9-24, and later reprinted in a number of publications (listed by Gohlman on p. 117, note 28). There are also a French translation by M. Achena and H. Massé, *Le livre de science*, Paris, 1955, I, pp. 6-11, and a Persian Translation by Ḡ. Ḥ. Sadīqī, *Sargoḏašt-e Ebn Sīnā*, Tehran, 1331 Š./1952.

The bibliography on the autobiography/biography is extensive. There is a useful collection of the traditional material in Saʿīd Nafīsī, *Zendagī o kār o andīša o rūzgār-e pūr-e Sīnā*, Tehran, 1333 Š./1954. A list of western European publications is given in Gohlman and supplemented by Ullmann in his review. References to eastern European publications can be found in B. and S. Brentjes, *Ibn Sina (Avicenna), der fürstliche Meister aus Buḫārā*, Leipzig, 1979, and A. V. Sagadeev, *Ibn-Sina*, Moscow, 1980. See also S. M. Afnan, *Avicenna: His Life and Works*, London, 1958. Ḏ. Ṣafā, *Jašn-nāma-ye Ebn Sīnā* I, Tehran, 1331 Š./1952. Idem. *Tārīḵ -e ʿolūm-e ʿaqlī-dar tamaddon-e eslāmī* I, Tehran, 1331 Š./1952, pp. 206-81.

Jūzjānī's biography has not yet been subjected to a critical study. Particularly perceptive analyses of the autobiography, on the other hand, are offered by R. Sellheim in his review of Ergin's Avicenna bibliography, *Oriens* 11, 1958, pp. 231-39, and by G. Lüling, "Ein anderer Avicenna. Kritik Seiner Autobiographie and ihrer bisherigen Behandlung," *ZDMG* Suppl. 3/1, 1977, pp. 496-513. D. Gutas, *Avicenna and the Aristotelian Tradition. Introduction to Reading Avicenna's Philosophical Works*, (forthcoming) contains a translation and an analysis of the autobiography.

(D. GUTAS)

iii. LOGIC

Avicenna's works on logic. Many of Avicenna's works on logic are extant and most of them have been published. With the exception of two Persian works, *Dāneš-nāma-ye ʿalāʾī* and *Andar dāneš-e rag* (see below, xi), all of his works are written in Arabic.

The nine parts that make up the first treatise of *Ketāb al-šefāʾ* (Book of the healing [of the soul]), Avicenna's philosophical summa, are devoted to logical matters. The first of these parts, the *Madḵal*, is an introduction to the other eight, each of which corresponds to one of the Aristotelian logical works, collectively known as the *Organon* or "instrument of science." The *Madḵal*, on the other hand, corresponds to Prophyry's *Isagoge*, a work that strongly influenced the writings of Islamic logicians as well as those of medieval Latin logicians. In

addition to these works, the first part of Avicenna's *Ešārāt* as well as the first part of the *Najāt* are summaries of Avicenna's version of Aristotelian logic.

The last work that Avicenna wrote on the subject of logic, which like the *Najāt* and the *Ešārāt* is a summary of his logic, is called *Manṭeq al-Mašreqīyīn*. It is the only extant portion of a philosophical encyclopedia he reportedly wrote or meant to write.

Avicenna on the subject matter of logic. Avicenna's works on logic usually begin with a discourse on the utility and the subject matter of logic. Logic for him is an instrument (*āla*) that has numerous functions. Thus in the *Najāt* (p. 3) which is an abridgement of the *Šefā*', he writes: "I start with a detailed description of the art of logic because it is the instrument which prevents the mind from committing errors both in conception (*ta-ṣawwor*) and in judgment (*taṣdīq*). It is the instrument that leads to true beliefs as well as to the reasons for and the right way to achieve them." By the "right way" Avicenna is referring to the methods by which one can reach a proper definition, as well as to the mastering of the theory of the syllogism and other methods which guard the mind against committing errors in judgment, i.e., in composing propositions. Knowing how to define leads to conceptual soundness, whereas knowing the methods that lead from the known to the unknown guarantees that one makes sound judgments. That which leads to a clear and definite conception (*taṣawwor mostaḥṣal*) is the expository statement (*qawl šāreḥ*) which can be either an essential definition (*ḥadd*) or a descriptive definition (*rasm*). That which leads to a definite judgment (*taṣdīq yostaḥṣal*) is an argument (*ḥojja*) which can be either a syllogism (*qīās*), an induction (*esteqrā*'), or an analogy (*tamṭīl*) (*Ešārāt*, pp. 181-85; *Manṭeq*, p. 10). According to Avicenna the latter can help identify not only what is true and valid, but also what is false and invalid (*Manṭeq*, pp. 5-6). Moreover, these methods are a necessary condition not only for scientific or theoretical inquiry, but also for the "salvation of man," which, according to Avicenna, lies in the purity of man's soul (*Treatise*, p. 14): "This purity of the soul is attainable by contemplating the pure form and avoiding this-worldy inclinations. And the way to these two is science. And no science which can not be examined by the balance of logic is certain and exact." This statement indicates that mastering the science of logic is, in Avicenna's view, a necessary condition for the knowledge of any discipline, be it theoretical or practical. In either case the purpose is knowledge: knowledge of the truth (*ḥaqq*) in the former case and of the good (*kayr*) in the latter (*Madkal*, p. 149).

This raises a question concerning Avicenna's views on the age-old debate about whether logic is a part or an instrument of philosophy. Avicenna argues (*Qīās*, p. 10) that there is no contradiction (*tanāqoż*) between those who maintain that logic is part of philosophy (i.e., the Stoics) and those who hold that logic is an introduction to and a tool for philosophy (i.e., the Peripatetics). The answer to this question depends,

according to him, on one's definition and understanding of the subject matter of philosophy, and any quarrel about this issue is both meaningless (*bāṭel*) and futile (*fożūl*) (*Madkal*, p. 16).

As for the subject matter of logic, Avicenna maintains that the secondary intelligibles (or concepts) (*al-maʿānī al-maʿqūla al-ṭānīa*) are the proper subject matter of logic (*Elāhīyāt* I, p. 10).

These secondary concepts depend on the primary concepts, Avicenna argues. By this he means that the former come about by abstraction (*tajrīd*) from the latter, i.e., they become ideas remote from the particular content which they have as primary concepts. The secondary concepts, in other words, are remote from the sensible forms (*hayʾāt maḥsūsa*) or from the particular material objects (*ʿEbāra*, p. 2, line 1). The primary concepts, on the other hand, are associated with the sensible material objects of which they are pictures (*ṣowar*) (ibid., p. 1, line 1).

Logic and language. The distinction between primary and secondary intelligibles occurs in several Arabic logical texts much before Avicenna's time. As many scholars have already pointed out, it occurs in (the Arabic translation) of Porphyry's *Isagoge* as well as in the writings of Fārābī and other Arab thinkers of the tenth and eleventh centuries. Yet, probably due to historical circumstances, it is Avicenna who is credited as the originator of this distinction, which remained a central issue in logical debate for several centuries.

This distinction, to which the modern distinction between object language and metalanguage is related, is of great importance for logicians. First it defines as the subject matter of logic those concepts which, in Avicenna's language, "have a mental existence that is not attached to matter at all or is attached to non-corporeal matter" (*Elāhīyāt*, p. 11). These are the secondary concepts and not the primary concepts. The latter, because they are descriptions of the *accidental* aspects of things, can not be the subject matter of logic.

Secondly, this distinction is an extension and a development of the Aristotelian theme concerning the three modes of discourse—written, spoken, and mental. Avicenna discusses these in the first chapter of his *ʿEbāra* under the section heading: "On the Relationship Between Things (*omūr*), Conceptions (*taṣawworāt*), Spoken Utterances (*alfāẓ*), and the Written [Form]," thus making the threefold Aristotelian division a four-fold division by adding the dimension of external things. Avicenna describes the relationships between the four modes as follows (paraphrased):

Due to a special faculty with which mankind is equipped (*qowwa ḥessīya*) external things are imprinted (*tartasem*) in the mind (*nafs*, soul). These imprints are present in the mind without the presence of the material object which they depict; this is the stage of abstraction (*tajrīd*). Thus, things have two modes of existence: an external existence (*wojūd fiʾl -aʿyān*), i.e., the individual material objects, and a mental existence (*wojūd fiʾl-nafs*). The argument then describes the need for a tool to communicate, thus adding the third dimension

(spoken). The fourth dimension (the written word) is explained through the need for continuity of ideas (*'Ebāra*, pp. 1-2). The third dimension (speech) and its relation to thought (the second mode) is a major theme in many of the logical writings of medieval philosophers, both Arab and Latin, many of whom claim that logicians are supposed to deal with utterances insofar as they signify thought.

According to Avicenna, however, language should on no account be considered an issue for logicians in their logical inquiries. Logicians, he says (*'Ebāra*, p. 5) are concerned with utterances (*lafz*) only accidentally (*be'l-'araz*) and only insofar as these utterances signify the concepts themselves (*al-ma'ānī anfosohā*), which are the proper subject matter of logic. Elsewhere, (*Madkal*, p. 22) Avicenna says that logicians need (natural) languages only in order to be able to address logical issues and to communicate with others about these issues. Logic, according to him, does not deal with utterances per se because these are only a tool and can theoretically be replaced by some other device (*ḥīla*) through which one can express logical relations without the mediation of a natural language. Avicenna criticizes those who think of language as an integral part of logic. By this he refers to the logicians of the tenth century (led by Fārābī) who adopted this view.

Yet, in the same passage of his *Madkal*. Avicenna states that "utterances have various modes (*aḥwāl*) on account of which the modes of the notions corresponding to them in the soul vary so as to acquire qualifications (*aḥkām*) which would not have existed without the utterances." From this statement, it is easy to infer—as has A. I. Sabra, for example (p. 763)—that "the secondary concepts, the proper object of logic, not only are reflected in language, but are generated by it." How can we reconcile these two positions of Avicenna concerning the thought-language relationship?

In the *Ešarāt* (p. 181) Avicenna modifies his initial position concerning the accidental nature of the relationship between logic and language by stating that languages have a universal side (*jāneb motlaq*) which is not confined to any particular language. It is this universal side of language with which logicians should be concerned. Unfortunately, Avicenna does not explain what counts as a universal feature of a language.

Whether in the final analysis utterances are a subject for logical inquiry or not, however, Avicenna devotes much of his logical theory to the *relationship* between language and thought or logic.

Utterances can signify either a universal notion ('man' or 'animal', each of which is predicated of many individuals) or a particular one ('Zayd', i.e., a particular man). Like all the logicians, he adopts the Porphyrian division of general terms into the following categories: genus (*jens*), differentia (*fasl*), species (*naw'*), property (*kāssa*), and accident (*araz 'amm*).

The list of five predicables, as these are called, is the subject matter of logic for it includes all the secondary concepts (or, to be more exact, the terms that signify these concepts).

Utterances, Avicenna says (*Ešarāt*, p. 187; *Manteq*, p. 14) can signify concepts in three different ways:

(1) By correspondence (*motābaqa*), i.e., when a certain term directly signifies the concept for which it was coined or designed (*mawzū'*), as in the term 'triangle' which signifies the notion of a three-sided figure or 'man' which signifies the notion of a rational animal.

(2) By inclusion (*tazammon*), i.e., when a concept is included in the meaning of a term. 'Man', for example, means and corresponds to the notion 'rational animal'. Thus both 'rational' and 'animal' are included in the meaning of 'man'.

(3) By implication (*eltezām*). i.e., when the meaning is only implied by the term (it neither corresponds to it nor is it part of its meaning), as in the relationship between the term 'ceiling' and the concept of wall (*Madkal*, p. 43; *'Ebāra*, p. 3).

Having dealt with individual terms, Avicenna next discusses how these terms combine to produce sentences. Like all logicians, however, his concern is not with the syntactical features of sentences as such, but rather with the statements (*qazīya, qawl jāzem*) that these sentences represent.

A statement is either predicative (*ḥamlīya*) ('S is P') or conditional (*šartīya*). The latter is a combination of two or more predicative statements and can be either a conjunctive conditional (*šartī mottasel*) (if ..., then ...) or a disjunctive conditional (*šartī monfasel*) (either ... or).

Avicenna's explanations of the different types of predicative statements, the division according to their quality, quantity and modality, and finally their different combinations in a syllogism are Aristotelian. His treatment of these same issues in relation to the conditionals relies heavily and perhaps exclusively on the Stoics who developed this branch of logic. Yet, Avicenna exhibits a superb understanding of these problems and presents them in a very coherent, systematic and clear style to the student of logic. His writings are, no doubt, the encyclopedia of Arabic logic.

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(SH. B. ABED)

iv. METAPHYSICS

General characteristics. Avicenna's metaphysical system is one of the most comprehensive and detailed in the history of philosophy. Its ingredients, its conceptual building blocks, so to speak, are largely Aristotelian and Neoplatonic, but the final structure is other than the sum of its parts. Avicenna himself hints at this when in introducing his magnum opus, the voluminous *Šefā'* (Healing), he writes: "There is nothing in the books of the ancients but we have included in this our book. If something is not found in a place where it is normally found, it would be found in another place where I judge it more fit to be in. I have added to this what I have apprehended with my thought and attained through my reflection, particularly in physics, metaphysics and logic" (*Šefā'*, *Isagoge*, pp. 9-10).

While the ingredients of his metaphysics derive "from the books of the ancients," Avicenna criticizes, selects and refines this material, but above all, informs it with his own insights to construct a world-view that has a character all its own. He also injects into it a pattern of deductive reasoning that anticipates the kind of thinking encountered in seventeenth-century European rationalist philosophies. At the same time, it should be remembered that his metaphysics is part of medieval Islam's intellectual history. It represents a climactic development of medieval Islamic Aristotelian and Neoplatonic thought. It also has to be understood (in part, at least) as a response to doctrines encountered in Islamic theology (*kalām*).

The Islamic philosopher who influenced Avicenna most was Fārābī (d. 339/950). Avicenna was indebted to Fārābī's various exegeses of Aristotle's works, logical and philosophical. He was also greatly influenced by the

Neoplatonic emanative scheme Fārābī outlines in some of his more popular works. Avicenna, however, introduces important modifications to this scheme, gives a more comprehensive and detailed account of the descent of beings from God, and makes the connection between his version of emanation and the essence-existence distinction explicit and intimate. Thus the two schemes while closely related remain distinct. It should also be added that Avicenna's theory of the state, which is connected with his metaphysics, is grounded in Fārābī's political philosophy. There is, moreover, in Avicenna's metaphysics an underlying Farabian motif, namely, that the quest after philosophical knowledge is for the sake of perfecting one's soul and hence for the attainment of happiness in this world and the next.

As to the Islamic theologians, the *motakallemūn*, his criticism of their doctrines tends to be muted. Nonetheless, it represents an important undercurrent of his metaphysical writings. He refers to the theologians by name when criticizing their interpretation of the meaning of the term "origination," *ḥodūṯ*, and the doctrine of the world's creation ex nihilo it implies. In other instances, however, he makes no explicit mention of the *motakallemūn*, but the doctrines he criticizes are definitely identifiable as held by one of their schools. Thus, for example, he criticizes the doctrine of latency (*komūn*), a theory that has Stoic antecedents, but which in Islam was developed by the Mu'tazilite theologian Ebrāhīm Naẓẓām (d. ca. 840) and identified with him and his followers. Avicenna is also highly critical of the notorious Mu'tazilite argument for bodily resurrection and the doctrine on which it is based, namely that non-existence (*'adam*) is "a thing" (*šay'*). Again, in his discussions of efficient causality, he answers typical arguments used by the Ash'arite occasionalist theologians to deny secondary causes. It should be added that as an Aristotelian, Avicenna criticizes and rejects atomism, his criticism, no doubt, being directed at the Greek atomists. But was it not aimed at *kalām* atomism as well? Here, again, there is no reference to the *motakallemūn*, the vast majority of whom were atomists. It is true that their doctrine of the transient atom, temporally created ex nihilo, contrasts sharply with the Greek concept of eternal atoms. But Avicenna's criticism is logically applicable to both versions of atomism. Taking into account that he opposed a number of the doctrines of the *motakallemūn*, including that of the world's creation ex nihilo, intimately related to their atomism, it seems unlikely that he did not intend his criticism of atomism to include its *kalām* version.

Criticism in Avicenna's metaphysical writings, by no means confined to the *kalām* or to atomism, is a manifestation of a very characteristic aspect of these writings, the analytic. It is here that one encounters his distinctions, clarifications and hard-headed attempts to solve problems. This is complemented by a synthetic aspect, where he strives to construct a deductive system. Both aspects, however, interweave, the system he constructs being constantly buttressed by the analyses and distinctions he makes. This system is admittedly an

ambitious one, particularly as it includes a cosmological scheme in which he endeavors to infer from the First Principle, God, the Ptolomaic astronomical scheme to which he subscribes. Such an attempt, wide open as it is to serious criticism, serves to reveal a facet of his rationalist approach, namely, his belief that in principle, at least, some human minds, whether intuitively or "naturally," as with prophets, or through arduous processes of discursive reasoning, are capable of grasping the basic structure of reality as it emanates from its Source.

This brings us to the "rationalist" character of Avicenna's philosophy, manifest in what he holds to be (a) the object of our knowledge and (b) the manner of attaining it. The principle of all existence, God, for Avicenna, is pure intellect ('aql mahż) and hence the highest object of human knowledge is intellect. All other existents, whether minds, souls or bodies, emanate from the pure intellect, God. They form an orderly hierarchical chain of causes and effects that are necessarily connected and hence (when all necessary conditions obtain) are rationally inferrable from each other. Knowledge by its very definition is conceptual, intellectual, consisting (on the human level) of the mind's reception of the intelligibles (ma'qūlāt). One class of these intelligibles which includes the self-evident truths of logic are received directly by all men from the Active Intellect, the last of the celestial intelligences emanating from God. They are received "directly" in the sense that this reception requires neither observation of the external world nor the thinking processes associated with such observation. Another class of intelligibles, less simple and less general, the secondary, consisting of universal concepts and inferences, are normally "acquired" in a different manner. Normally, they require the presence of the self-evident logical truths and observation of the external world with concomitant thinking activities on the sensory, imaginative, particular levels. Observation and its accompanying thinking activities, however, do not themselves in the real sense acquire the secondary intelligibles. Rather, they are activities that prepare the soul for the reception of the secondary intelligibles from the Active Intellect. Only prophets can receive the secondary intelligibles directly, without the need of the preparatory activities of the soul and the learning processes that accompany them. Thus the object of knowledge is the intelligible, received from a rational principle, the Active Intellect.

But this is not all. To fully appreciate the extent of Avicenna's rationalism it should be noted that he also includes with the class of intelligibles that normally do not require for their reception perception of the external world primary concepts that are the most general—the concepts of "the existent," "the thing," and "the necessary." These, like the self-evident propositional truths of logic, are "impressed on the soul in a primary manner." This class of intelligibles, consisting of the primary concepts and the self-evident truths of logic, are sufficient in Avicenna's system for formulating a proof leading to the existence of God, demonstrating

His uniqueness, and for inferring the existing of the world (with its order) from God. Thus the highest form of metaphysical knowledge is attainable rationally, independently of our perception of the external world.

The affinity of this rationalism to seventeenth-century continental European modes of philosophizing has often been noted, particularly the similarity between the Cartesian *Cogito* and Avicenna's hypothetical example of a human floating in space (cf. Psychology). According to this example, if we imagine ourselves to be born all at once, fully mature, but suspended in space in such a manner that we are totally unaware of our physical and bodily circumstances, we would still be aware of ourselves as individual selves. Without denying parallels between this example and aspects of Descartes's process of systematic doubting of the senses, it is important to recognize a difference quite fundamental for understanding Avicenna's metaphysical approach.

Avicenna's metaphysical starting point is not doubt. (The primary intention of the example of a person suspended in space is to show that the human rational soul is immaterial and individual.) As has been noted, the concept of "the existent" for him is a primary concept, intuited immediately. It is indubitable. He begins one version of his proof from contingency for God's existence with the statement: "There is no doubt that there is existence" (lā šakka anna hāhonā wojūdan). But existence, as he points out, divides into that which is in itself necessary and that which in itself is only possible. The existents immediately encountered (including ourselves) are in themselves only possible. They can exist or not exist. Yet in fact they do exist. Why is this the case? In his metaphysics, Avicenna, in effect, seeks an answer to this very question, namely, why is it that that which in itself is only possible (and this includes the whole world as distinct from God) exists at all?

Definition and scope of metaphysics. Although the question of why is it that that which in itself is only possible exists at all is at the heart of Avicenna's metaphysics, it does not constitute its starting point. In the *Metaphysics* of the Šefā', for example, it suggests itself quite unobtrusively when Avicenna is establishing one of his basic premises for his proof of God's existence. Nor is the existence of God and the simplicitly of His essence "the subject matter" of metaphysics. Rather, as will be shortly seen, these are among the things "sought after" in metaphysics. Avicenna's starting point and conception of metaphysics are Aristotelian. This Aristotelianism is clearly seen in the distinction he draws between metaphysics and the two other theoretical sciences, physics and mathematics. He makes this distinction in terms of two related criteria: (a) the relation of the objects of knowledge belonging to each of these sciences to matter and motion; (b) the subject matter, in its broadest sense, of each of these disciplines.

The objects of knowledge of both physics and mathematics are always "mixed" with matter (and motion), but in different ways. With physics, the object

is always "mixed" with a specific kind of matter. A human being, for example, as the object of natural science, can not be separated from a specific kind of matter, from the material body of the genus, animal. Again, the object may be of a different sort that can be separated from matter—causality, for example. But when it is the object of natural science, it must be associated, not only with matter, but with matter of a specific kind. The physicist is concerned with the cause of motion of this or that specific kind of matter, not with causality as such. In the case of mathematics, on the other hand, although its object is always "mixed" with matter, it is not "mixed" with a specific kind of matter. Triangles and squares in external non-mental existence must be of some kind of material, but not confined to a specific kind. As such, as objects of knowledge, they undergo a degree of abstraction, whereby the mathematician can consider them dissociated from a specific kind of matter. Other objects of mathematical knowledge, such as plurality or unity, can be separated from matter. But as objects of mathematical inquiry, they are treated as associated with matter, but not of a specific kind. Again, there is a degree of abstraction. But they are not regarded in pure abstraction. The mathematician considers them in terms of quantity, related to some kind of matter or another, but not confined to a specific kind.

Metaphysics, however, always has as its object that which is not "mixed" with matter. The object may be necessarily immaterial, as with God and mind. It can, however, consist of objects that can mix with matter. The metaphysician, however, is concerned with these objects in themselves, *men hayto hīa hīa*, abstractly and immaterially. Thus to take causality again as an example, unlike the natural scientist who is concerned with the cause of a specific kind of matter, the metaphysician is concerned with causality as such and with causality as one of the concomitants of the existent considered as such. This brings us to the second criterion for the distinction between the three theoretical sciences: their respective subject matter.

All three theoretical sciences have for their subject matter the existent, but with a difference. Physics is concerned with the existent inasmuch as it is in motion or in its relation to motion. Mathematics is concerned with the existent inasmuch as it is quantified or relates to measure and quantity. Metaphysics, on the other hand, has for its object the existent without qualification. Its subject matter is the existent inasmuch as it exists (*al-mawjūd be mā howa mawjūd*), or, as Avicenna puts it in his *Najāt*, "absolute existence" (*al-wojūd al-motlaq*). Metaphysics undertakes investigating the relation of the existent to the ten categories, the states that affect it, and the concomitants (*lawāheq*) that adhere to it. Following the methodology of the *Posterior Analytics*, Avicenna distinguishes between "the subject matter" (*mawżū'*) of metaphysics and that which "is sought in it" (*matlūb*). Among the things that are sought after and established in metaphysics are the principles presupposed in natural science and mathematics. In this sense, physics and

mathematics receive "their credentials," as it were, from metaphysics.

Among the things "sought after" in metaphysics are the four causes (material, formal, efficient, and final) of existing things and the ultimate cause of all existence, God. Hence, investigating the four causes and the existence and nature of God do not constitute "the subject matter" of metaphysics. This, as has been pointed out, is the existent inasmuch as it exists. But the concept of the existent qua existent as the subject matter of metaphysics raises a methodological difficulty regarding the quest in it for the principles of existing things. "If the existent is made the subject of this science," it could be argued, writes Avicenna, "then the principles of the existent can not be established in it, since in every science, investigation is of things concomitant to its subject, not of its principles" (*Šefā'*, *Metaphysics*, p. 14).

In the endeavor to resolve this problem, Avicenna maintains that "theoretical inquiry of the principles is also an investigation of the cocurrent concomitants (*'awārez*) of this subject." For, being a principle is not a defining characteristic of "the existent." He then adds a qualification: The principle sought after is not the principle "of the whole of existence." Otherwise the principle would be a principle of itself. The principle that is sought after is hence the principle of the existent that is caused. God, to paraphrase Avicenna, can not be the principle of His own existence, but is the principle and cause of all other existents.

This brings us to the ultimate quest, ultimate principle sought after in metaphysics, the existence of God. This existence, Avicenna asserts, is not self-evident, but has to be demonstrated. Furthermore, its demonstration belongs solely to metaphysics, not to any other theoretical science. Assertions relating to God's existence in the *Physics* of the *Šefā'*, he states, were out of their place, put there only to whet the reader's appetite. As indicated earlier, Avicenna offers not only a rational proof for God's existence, but also a rational deduction from this existence of the world's existence and order. Proof and deduction, however, employ the distinction between essence and existence, for which Avicenna is noted. This distinction underlies his very significant theory of universals, as well as his theory of efficient causality. For this reason, before turning to the proof of God's existence, it is perhaps best to begin with this distinction as it relates to his theory of universals and also say something supplementary about his theory of efficient causality.

The essence-existence distinction. For Avicenna, the distinction between essence and existence applies to all existents, actual and potential, other than God. At the heart of this distinction is the theory of the essence, quiddity, or nature of such existents considered strictly in itself. An essence, Avicenna states, may exist in external reality, associated with circumstances peculiar to that reality. These circumstances associate with it to form a particular existent. The essence may also exist as a concept in the mind where in this mental existence it also is associated with circumstances peculiar to this

existence—for example, circumstances that render it a subject or a predicate. But, he maintains, there is also "a consideration of the essence inasmuch as it is that essence, without being related to the two [kinds of] existence" (*Šefā*, *Isagoge*, p. 15). In itself, or as such, the essence does not include the idea of existence, whether this is external or mental existence. Existence is not a defining characteristic of essences. From what a thing is, it can not be inferred that it exists.

According to Avicenna, the quiddity (or essence) considered simply as a quiddity, excludes not only the idea of existence, but also the concomitants of existence, unity and plurality. Thus in his typical example of "horseness" as a quiddity considered in itself, he states that "it is neither one nor many, exists neither externally nor in the soul." Moreover, he maintains, the quiddity considered in itself excludes the ideas of universality and particularity. In short, the quiddity as such excludes the ideas of existence, unity, plurality, particularity, and universality.

Avicenna uses this concept of the quiddity considered in itself and the distinction between essence and existence that it carries with it to resolve two problems pertaining to universals. The first is a logical problem that has to do with the predication of a quiddity of a subject. If the quiddity as such included universality and particularity, the results would be odd indeed. For then universality or particularity (but not both, since they are mutually exclusive) would form part of the very definition of the quiddity. To use his example, if animality includes universality in its very definition, then we can not predicate it of a particular animal. If, on the other hand, particularity is included in the definition of animality, then this would not merely exclude its predication of a universal subject, but of any individual other than the one specified in the quiddity's definition.

The answer Avicenna finds is in the concept of aquiddity which, when considered in itself, is devoid of the notions of universality and particularity. Universality and particularity are then added to it when it is conceived in the mind. This brings us to Avicenna's important theory of the universal, which for him is always a concept in the mind. The quiddity as such is not a universal. It is, however, a component of the universal. For the universal is compounded of two things, the quiddity as such and universality, that quality that renders the quiddity predicable of many instances. The general framework of this theory is Aristotelian. But Avicenna introduces refinements and the distinction between the quiddity as such and universality. He also adds to it a Neoplatonic dimension by maintaining that quiddities have existence in the celestial intelligences, as well as in the particulars of sense and in the human minds.

The second problem relating to universals which Avicenna strove to resolve is metaphysical. This is the problem of the one and the many, in an Avicennian context. How can the selfsame quiddity be "found in many," to use his own words, and not be many? To answer this, Avicenna again invokes the concept of the

quiddity considered as such. For although a quiddity can exist in external reality associated with particular circumstances, rendering it in this association an individual, it can be considered in itself, for what it is, in dissociation from these circumstances. When thus considered, it excludes the ideas of unity and plurality: These become totally inapplicable to it. Thus if one asks whether a quiddity like humanity is one or many, Avicenna's reaction to such a question is that "there is no need for a reply because inasmuch as it is the defining identity (*howīya*) of humanity it is other than the two alternatives. In the definition of that thing, there is nothing except humanity alone" (*Šefā*, *Metaphysics*, pp. 197-98).

If, then, existence (and its concomitants) are extraneous to the quiddity as such, the quiddity is existentially neutral, so to speak. There is nothing in it to tip the balance in favor of its existence rather than its non-existence. Its existence and non-existence are equally possible. That a quiddity which in itself is only possible in fact exists calls for explanation. The explanation that Avicenna offers includes his establishing a premise necessary for his proof of God's existence. This is the premise that the existent that in itself is only possible is causally necessitated by another existent. The argument to establish this premise, as will be shortly seen, is a metaphysical argument. It is, however, complemented by an epistemological argument (which was later adopted by Latin scholastics) that should be noted. This is the argument from the observation of regularities in nature. Avicenna is only too well aware that such observation alone is insufficient to establish the principle of necessary causal connection. Such observation, he asserts, leads only to concomitance. Something else is needed. This is hidden premise (*qīās kafīy*) to the effect that if the regularities were accidental or coincidental they would not have happened always or for the most part (cf. Aristotle, *Physics* 2.5.156b.10-16). From this he concludes that these regularities are the necessary outcome of inherent essential casual properties in things. It should be added that Avicenna subscribes to the four Aristotelian causes. Unlike Aristotle, however, he does not confine efficient causality to the production of motion, but maintains that, as with God in producing the world, it is productive of existence itself.

God's existence and the world's emanation. Demonstrating God's existence, His utter oneness and the manner of the world's emanation from Him are the high points of Avicenna's metaphysical endeavor. The proof he offers is his proof from contingency, noted for its a priori character, that is, for its total dependence on reason. Thus, he does not argue for the contingency of things on the basis of our observation of change in the world. For the concept of the possible is either a primary concept, immediately intuited by the mind, or rationally derived from a primary concept, immediately intuited by the mind, the concept of the necessary. It is also a metaphysical proof, as distinct from a proof in *Physics*. Thus it is not based on the observation of motion in the

world, leading ultimately to the Prime Mover. It is not in any sense a proof that infers God's existence from the observation of His handiwork. On this Avicenna is explicit. After giving one version of his proof from contingency, for example, he writes: "Reflect on how our proof for the existence and oneness of the First and His being free from attributes did not require reflection on anything except his existence itself and how it did not require any consideration of His creation and acting, even though the latter [provide] evidential proof (*dalīl*) for Him. This mode, however, is more reliable and noble, that is, where when we consider the state of existence, we find that existence inasmuch as it is existence bears witness to Him, while He thereafter bears witness to all that comes after Him in existence" (*Ešārāt*, p. 482).

Although Avicenna gives closely related but somewhat different versions of the proof, they all share its a priori character. Underlying these versions is Avicenna's theory that there are primary concepts, those of "the existent," "the thing," and "the necessary," that are rationally intuited without the need for perceptual experience of the external world. These parallel the self-evident propositional logical truths that, again, are purely rational. The versions of the proof also share basically the same structure. An existent in itself is either necessary or only possible. If necessary, then this is the existent we are seeking, God. If only possible, then it can be demonstrated that such a contingent being ultimately requires the existent that is necessary in Himself. In either case, there must be an existent necessary in Himself, the one God.

The version of the proof in the *Metaphysics* of the *Sefā'*, although it is dispersed in different places in this work and has to be reassembled, remains the most detailed and comprehensive. It is also the one that argues explicitly for the causal premise presupposed in the other versions. The proof in this version can be summed up as follows. Existents are either such that their existence is in itself necessary or only possible. If we suppose an existent that in itself is necessary, then, it can be shown that it would not be caused, would necessarily be one, unique and without multiplicity in its being. If we suppose an existent that in itself is only possible, then it can be shown that it would require for its existence the existent that is necessary in Himself. For an existent that in itself is only possible can equally exist or not exist. Why, then, if we suppose it to exist, should it exist at all? An external cause would be needed to explain why it had been "specified" with existence rather than non-existence. Now if in relation to the supposed cause, the existence of the contingent is not "necessitated," then it would remain purely possible and no explanation for its existence would have been given. Another cause would have to be posited and if this is not a necessitating cause, yet another, and so on *ad infinitum*. Even if, for the sake of argument, the infinity of such causes is allowed, they would still not explain why the contingent exists. Hence, since we have supposed it to exist, then the extraneous cause would

have to necessitate it. In other words, Avicenna is arguing not merely that if the contingent exists, it must have an extraneous cause, but that this extraneous cause necessitates its existence. Thus the existence of such a contingent, while in itself only possible, would be necessary through another.

The cause that necessitates its effect, for Avicenna, is the essential cause. It is the accidental cause that precedes its effect in time and as such a chain of accidental causes and effects can be infinite. A chain of such accidental causes would not constitute an actual infinite. Not so with the chain of essential causes and their effects. The essential cause coexists with its effect, its priority to the effect being ontological not temporal. A series of coexisting causes and effects can not be infinite. For the infinite they would constitute would be an actual infinite, which, for Avicenna, is demonstrably impossible. The chain must have a first cause, the existent necessary for Himself, God.

That Avicenna also wishes to "infer" the existence of the world and its order (though not in all its detail) from God's existence, in the way in demonstration the effect is inferred from the cause, is clear from the following statement of intention early in the *Metaphysics* of the *Sefā'*: "It will become clear to you anon through an intimation that we have a way of proving the First Principle, not by the method of evidential inference (*estedlāl*) from the things perceived by the senses, but by way of universal rational premises that render it necessary that there is for existence a principle that is necessary in its existence, that makes it impossible for this principle to be in any way multiple, and makes it necessary that the whole is necessitated by Him according to the order possessed by the whole. Because of our incapacity, however, we are unable to adopt this demonstrative method which is the method of arriving at the secondary existents from the primary principles and the effect from the cause, except with some groupings of the ranks of existing things, not in detail" (*Sefā'*, *Metaphysics*, p. 21).

There can be little doubt that the "groupings of the ranks of existing things" in the last sentence above refers to the celestial triads which, according to Avicenna, emanate from the first intelligence that proceeds directly from God. In explaining this emanative scheme, he employs the concepts of the necessary in itself, the necessary through another, and the possible in itself, the latter two being the consequence of his essence-existence distinction.

God, according to Avicenna, undergoes an eternal act of self-knowledge, resulting in a necessitated effect, a first intelligence. Involved here is the principle that from the one only one proceeds. The first intelligence then encounters the three facts of existence: (1) God's being necessary in Himself; (2) its own existence as necessitated; (3) its own existence as in itself only possible. It conceives each of these facts of existence. Since from the one only one proceeds, each of these three acts of cognition produce one existent—hence the triads. Its act of knowing (1) produces another intelligence; of knowing

(2) a celestial soul; of (3) a celestial body, the outermost sphere of the universe. The second intelligence undertakes a similar cognitive process resulting in the emanation from it of the sphere of the fixed stars. This cognitive activity is repeated by successive intelligences, giving rise to successive triads. The bodily components of these triads include the planetary spheres and the spheres of the sun and the moon. The last of the celestial intelligences is the Active Intellect, from which our world of generation and corruption emanates. In each of the celestial triads, the intellect acts as the teleological cause of that triad: The soul within the triad desires the intellect, causing the eternal circular motion of the third component of the triad, the celestial sphere. It should be added that the emanative process is eternal. God, the eternal necessitating cause, ever in act, necessitates the existence of an eternal effect, the world.

Divine knowledge, providence, and prophethood. The world thus emanates from God as a consequence of His self-knowledge. This self-knowledge entails His knowing Himself as the cause of all existents, and hence knowing the consequent effects of His causality. Avicenna states that in this way God knows all particular existents, but "in a universal way." This type of knowing the particular also belongs to the celestial intelligences, as distinct from the celestial souls that know particulars in their particularity. To understand what knowing the particular "in a universal way" means, one must consider a peculiarity of the Avicennian celestial triads.

This peculiarity, a consequence of the principle that from the one only one proceeds, consists in the fact that in this system each existent in each of the celestial triads is the only member of its species. This is in total contrast with the existents in the terrestrial world, where a triad of existents may be said to continue. But this would be a triad of kinds only, not of individuals each of which is the sole member of its species. Thus there are numerous human intellects of a species, numerous souls and numerous bodies of various species. Now Avicenna holds that divine knowledge is conceptual, eternal, and changeless. Its object is the universal. In the case of the celestial triads, God knows the species of each individual of the triad and, moreover, that each individual is the only member of that species. In this sense, knowing the universal species means knowing the one member of this species. This applies also to celestial events like eclipses whose occurrences are mapped out eternally for God, so to speak, without this involving any change in Him. This is also possible because the event is related to individuals that are the only members of their species. When it comes to the terrestrial world, where the individual is not the only member of its species, God (and the celestial intelligences) knows only the kinds of existents, not their individual members. Of the celestial beings, only the souls in the triads know the particulars of the terrestrial world as particulars. These souls are instrumental in causing particular temporal events in the terrestrial world. Not only do they know the particulars in this world as particulars, but have foreknowledge of future terrestrial temporal events.

Closely associated with Avicenna's doctrine of divine knowledge is his doctrine of divine providence. He writes: "Providence consists in the First's knowing in Himself [the mode] of the good order, in His being in Himself a cause of goodness and perfection in terms of what is possible, and in His being satisfied with [its having the order] in the manner that has been mentioned. He would then conceive the good order in the best possible manner. Consequently, what He conceives in the best possible manner would emanate from Him in the manner—in terms of what is possible—that is most completely conducive to order" (*Šefā'*, *Metaphysics*, p. 415).

This is not to deny the existence of evil which enters the world of generation and corruption, associated with terrestrial matter and potency. In a detailed analysis of the different types of mundane evils, moral and physical, Avicenna maintains that they affect individuals, not the species and that, although numerous, they are not predominant. Most evils are accidental consequences of what produces the greater good. Fire, for example, is basically beneficial, but on occasion harms individuals. Could not God then have created the world free from such harm, such evil? Not this type of world, Avicenna answers, since then, to take the example of fire, he would have to create a fire that neither warms nor burns, a contradiction. A world free from evil is possible in a different mode of existence. But the creation of such a world would exclude the creation of ours which, though not without evils, would have greater good than the former. For Avicenna, this is the best of all possible worlds.

Political philosophy. The concept of divine providence relates Avicenna's metaphysics to his political philosophy. This political philosophy, essentially Farabian, rests on the theory of prophethood and revelation. The law, revealed through prophets, is not only necessary for the existence of human society, but for the very survival of man. It consists of the truths of theoretical and practical philosophy, conveyed, however, in language which the vast, non-philosopher, majority of humanity can understand. This is the language of the particular example, instead of the abstract universal concept, of the image and the symbol. Without prophets and the law they reveal the good order will not be realized in the terrestrial world of men. The existence of the law-revealing prophet is the necessary consequence of God's knowledge of the good order, an expression of His providence.

The appearance of prophets on the historical scene, however, is very infrequent. This has practical implications regarding the setting down of institutions and traditions to ensure the continuance of the good order once the prophet is gone. But the infrequency of the appearance of prophets has a metaphysical side, a metaphysical explanation involving Avicenna's doctrine of the human soul. This soul, individual and immaterial, emanates from the celestial intelligences. It is created with the body, but not imprinted in it. Its

association with the body is conditioned by the material compositions that receive it. These compositions vary and their variance determines the quality of the souls that are created with them. The bodily composition that induces the reception of a prophetic soul, which is the highest quality of human souls, occurs very infrequently, Avicenna tells us. This soul is endowed with exceptional cognitive powers. Some prophetic souls receive symbolic knowledge directly from the celestial souls. Others (of a still higher rank) receive from the Active Intellect all or most of the intelligibles instantaneously. These intelligibles are then conveyed in the language of imagery, example, and symbol understood by all.

In the hierarchy of existents, the prophet stands highest in the world of generation and corruption. In Avicenna's cosmology he is, in effect, a link between the celestial and terrestrial worlds. It is perhaps no accident that Avicenna concludes the *Metaphysics*, which is the last part of the encyclopedic *Šefā'*, with the following words: "If one combines with justice speculative wisdom, he is the happy man. Whoever, in addition to this, wins the prophetic qualities becomes almost a human god. Worship of him, after worship of God, becomes almost allowed. He is indeed the world's earthly master and God's deputy in it."

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Among Avicenna's numerous shorter Arabic works pertaining to metaphysics, special attention must be given to the following two books: (1) *Ketāb al-ešārāt wa'l-tanbīhāt*. This was edited by J. Forget, Leiden, 1882, and recently by S. Donyā, Cairo, 1958. Donyā's edition includes the very important commentary on this work by Naṣīr-al-dīn Ṭūsī (d. 1274). For a French translation, of the *Ešārāt*, see *Ibn Sīnā* (*Avicenne*), *Le livre des directions et remarques*, tr. A. M. Goichon, Paris, 1955. (2) *Ketāb al-najāt*, Cairo, 1938. For a translation of the part on the soul of this work, see F. Rahman, *Avicenna's Psychology*, London, 1952, repr. Westport, Conn. 1981. For an English translation of the *Metaphysics* of Avicenna's most important work in Persian, his *Dāneš-nāma-ye ʿalā'ī*, see P. Morewedge, *The Metaphysics of Avicenna (Ibn Sīnā)*, New York, 1973.

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(M. E. MARMURA)

v. MYSTICISM

Avicenna and Sufism. Avicenna's philosophical system, rooted in the Aristotelian tradition, is thoroughly rationalistic and intrinsically alien to the principles of Sufism as it had developed until his time. It is also self-consistent and unified, and therefore free of any other mystical or esoteric aspect—however these terms are understood—that would represent a different form or body of knowledge and create a dichotomy within the system. Avicenna, however, did maintain the validity of Sufism, just as he maintained the validity of other manifestations of Islamic religious life, but he interpreted it, just as he interpreted them, in terms of his own system.

Avicenna's epistemological theory revolves around the pivotal concept of *ḥads*. All knowledge consists of the totality of the intelligibles contained in the intellects of the celestial spheres, and is structured in a syllogistic fashion; that is, it contains the extreme terms of syllogisms along with the middle terms which cause, or explain the conclusions. The acquisition of this knowledge, which is the goal of all human activity because the misery or bliss of the immortal rational soul in the hereafter depends directly upon it, proceeds accordingly by the consecutive discovery of middle terms. The capacity to hit spontaneously upon the middle term in any syllogism is called *ḥads*. It is a mental act whereby the human intellect comes into contact (*ettesāl*) with the active intellect (*ʿaql faʿʿāl*) and receives what Avicenna

frequently describes as "divine effluence" (*fayż elāhī*), i.e., knowledge of the intelligibles through the acquisition of the middle terms. *Ḥads* constitutes the *only* point of epistemological contact, in Avicenna's thought, between the sublunar and the supralunar realms, or between the mundane and the transcendental, and it refers to a strict and precise syllogistic process. Avicenna admits no other way to a knowledge of the intelligible world and ultimately of the Necessary Existent (*wājeb al-wojūd*).

Avicenna derived the concept of *ḥads* directly from a passage in Aristotle's *Posterior Analytics* (89b.10-11, *eustochia = ḥosno ḥadsen* in the Arabic translation, 'A. Badawī, *Manṭeq Aresṭū*, Cairo, 1948, p. 406), to which he added Galen's idea that the different degrees of acumen in people are consequent upon the temperament of the body (I. Müller, *Galeni Scripta Minora*, Leipzig, 1891, II, p. 79 = H. H. Biesterfeldt, *Ketāb fī anna qowa'l-nafs...*, AKM 40/4, p. 43). The resulting theory in its final form, Avicenna's original creation, enabled him not only to rank people on the basis of their capacity for *ḥads*, but also to suggest the means whereby one could improve one's standing on that scale. If, as Galen taught, the faculties or powers of the soul follow the humoral temperament of the body, then clearly the more balanced temperaments would have a greater predisposition for hitting upon the middle terms. One should therefore strive to acquire a balanced temperament, or, in religious terminology, a pure soul. At the lower end of the scale there is thus the impure dullard, and at the upper end the pure person who can consistently hit upon the middle terms. This is the prophet. In his case, "the forms of all things contained in the active intellect (i.e., the intelligibles) are imprinted on his soul either at once or nearly so. This imprinting is not an uncritical reception of the forms merely on authority (*taqlīd*), but rather occurs in an order which includes the middle terms" (A. F. Ahwānī, ed., *Aḥwāl al-nafs*, Cairo, 1371/1952, p. 123 = *al-Šefāʾ*, *al-Nafs*, ed. F. Rahman, London, 1959, pp. 249-50 = *al-Najāt*, Cairo, 1331, pp. 273-74).

In order for those at the lower end of the scale of *ḥads* to gain any of this knowledge, it is obvious that their only recourse is to acquire a balanced temperament (a pure soul) in anticipation of a later or posthumous understanding, and to learn something about this knowledge in terms familiar to them. This is the function of religious life in all its manifestations. The prophet communicates the knowledge of the intelligible world in symbols and in language accessible to the masses because syllogistic discourse, the medium in which he himself received this knowledge, is unintelligible to them; and he lays down legislation whose purpose is to purify their souls. This is the reason for the efficacity of religious prescriptions like fasting and ritual prayer, of popular religious practices such as the visitation of saints' tombs, and of the ascetic practices of the Sufis. Needless to say, these practices are beneficial not only to the dull masses but also to philosophers when they are faced with a difficulty and can not find a

middle term. This is the reason for Avicenna's recourse to prayer in similar circumstances, as recounted in his autobiography (W. E. Gohlman, *The Life of Ibn Sina*, Albany, New York, 1974, p. 29).

Avicenna composed his works in a variety of styles for the same reason, i.e., in order to reach different layers of audience with the same knowledge, not the same audience with a different, "esoteric," knowledge. He used symbol and allegory, and some terminology from Sufism, in order to convey this knowledge that grants salvation to those best disposed to receive it in such a medium. Otherwise the symbols and Sufi terms correspond exactly to the philosophical concepts of his system. The *ʿāref* mentioned in the final chapters of the *Ešārāt*, for example, refers to the person whose rational soul has reached the stage of the acquired intellect. In the case of the allegory, *Ḥayy b. Yaqẓān*, it corresponds precisely to Avicenna's theory of the soul, as demonstrated by A. -M. Goichon (*Le récit de Ḥayy ibn Yaqẓān commenté par des textes d'Avicenne*, Paris, 1959). In all these instances there is no reference to another knowledge (there is none, other than that contained in the active intellect), nor to another way of acquiring it (there is none, other than through hitting upon middle terms, *ḥads*).

This is the context in which the treatises listed by G. C. Anawati under *taṣawwof* ought to be seen (*Moʾallafāt Ebn Sīnā*, Cairo, 1950, nos. 213-44). *Taṣawwof* is not a proper label for these treatises, for they do not treat Sufism in terms of Sufism; they deal, rather, with the workings of the rational soul in Avicenna's philosophical system, its relationship to the active intellect, and the influence which the latter exerts on the former, and its results (prophecy, miracles, wonders, etc.). Metaphysics of the rational soul would be a more accurate category, for in his philosophical summae Avicenna treated these very subjects in the section on metaphysics right after theology. Apart from these subjects which he incorporated in his philosophical system and explained in the fashion described, Avicenna had no relation with Sufism, or indeed, with Sufis. The celebrated meeting with the Sufi Abū Saʿīd Abi'l-Kayr in all likelihood never took place; only the correspondence appears to be genuine (F. Meier, *Abū Saʿīd-i Abū l-Ḥayr (357-440/967-1049): Wirklichkeit und Legende*, Acta Iranica 11, Tehran and Liège, 1976, pp. 26-28). Popular tradition in the East after Avicenna's death, however, partly misled by the Sufi terminology in some of his works, and partly through a misunderstanding of his theory of *ḥads* as mystical illumination, considered him a mystic and occasionally even somebody who claimed to be a prophet; but this has nothing to do with the historical Avicenna (see Biography).

The question of the Easterners (Mašreqīyūn). Avicenna's development of an epistemological theory, whereby the intelligibles are acquired either by personally hitting upon the middle terms or by receiving them from a teacher who himself successfully traversed part of the syllogistic process mirroring the structure of the

intelligible world, enabled him to have a progressive view of the history of philosophy. Although the knowledge to be acquired, the intelligibles, in itself and on a transcendental plane is a closed system and static, on a human level and in history it is evolutionary: Each philosopher, through his own syllogistic prowess, modifies and completes the work of his predecessors, thus presenting a body of knowledge that is an ever closer approximation of the intelligible world, and hence of truth itself. For Avicenna, the philosophical tradition that had achieved this best was the Aristotelian, and he saw himself as essentially belonging to it while at the same time revising and modifying it on the basis of his own syllogistic analyses. In the introduction to his *Mašreqīyūn* he specifically says that the Peripatetics are the philosophical school most worthy of adherence, but he criticizes his predecessors for having failed to revise Aristotle's system despite the fact that the truth, i.e., the intelligibles contained in the active intellect, "can be discovered by anybody who examines a lot, reflects long, and has almost fully developed the ability to hit upon the middle terms" (*ḥads*). He himself claims to have done so because, he says, he acquired knowledge, i.e., the philosophical sciences reflecting the intelligible world, "from a direction (*jeha*) other than that of the Greeks," i.e., not from teachers and their books (the Greeks), but from the direction of *ḥads*, or of the active intellect, by coming into contact with it while hitting upon middle terms (*Manṭeq al-Mašreqīyīn*, Cairo, 1910, pp. 3-4). In the *Dāneš-nāma* (*Ṭabīʿiyāt-e Dāneš-nāma-ye ʿalāʾī*, ed. S. M. Meškāt, Tehran, 1331 Š./1952, pp. 144-45) he makes an obvious autobiographical reference to this effect, while the autobiography itself is an illustration of the very concept of *ḥads* (see Biography: Analysis of the Autobiography). Avicenna did not, however, claim to have acquired all the knowledge contained in the active intellect; in other writings he bemoans the limitations of human knowledge and urges his readers to continue with the task of improving philosophy and adding to the store of knowledge.

This was Avicenna's theoretical position regarding the piecemeal acquisition of knowledge by successive philosophers. In actual practice, this manifested itself in a tendency, observable in all his major philosophical works, to follow a course increasingly more independent from the transmitted formats of exposition and discussion in the Greco-Arabic Aristotelian tradition. With each successive stage in his literary career, the treatment of the traditional material, as well as of his own revisions, became more systematic, and this was accompanied either by an attenuated emphasis on the historical aspects of a question, or by a sharper contrast between the traditional positions and his own. The texts on Eastern philosophy and the Easterners represent one of the later, but temporary stages of this development. These texts are the following:

1. *Ketāb al-Mašreqīyīn* (The book of the Easterners). It was written after the *Šefāʾ*, in 418-19/1027-28, and the greater part of the first and only draft was lost in 425/1034. The title of the work, as given above, is the

only one attested in the oldest and most reliable MS containing the extant part on logic (Cairo, Dār al-Kotob, Ḥekma 6M, f. 116v); the expressions *al-ḥekma al-mašreqīya* and *al-falsafa al-mašreqīya* which are occasionally used by Avicenna and others seem to be designations of the contents of the work rather than verbatim references to the title. *Manṭeq al-Mašreqīyīn* is the title invented by the Cairene publisher of the extant part on logic. The work was another summa of philosophy in the Aristotelian tradition, as revised by Avicenna on the basis of his syllogistic emendations (*ḥads*). It was parallel to the *Šefāʾ* in content, except that it was systematic in method, whereas the *Šefāʾ* also treated views which traditionally formed part of the discussion on a given subject, but which were either disproved by Avicenna or no longer possessed, in his estimation, any intrinsic value. Avicenna referred to this stylistic difference between the two books in his prologue to the *Šefāʾ*, a prologue that was written after both books had been completed (*Madkal*, Cairo, 1952, p. 10). Because of the parallel content of the two books, Avicenna did not repeat in the *Mašreqīyūn* those parts of the philosophical sciences for which he had nothing new to offer. The book thus contained logic (i.e., the "instrumental science," *al-ʿelm al-ālī*, the other name for *manṭeq* referred to in the introduction, p. 3), metaphysics (in its two major subdivisions, universal science and theology), some parts of physics, and some of ethics (p. 8). The part that has survived contains the introduction and logic, from the beginning to the section corresponding to the *Prior Analytics*. A section containing the part on physics and identified in some MSS as belonging to this work needs to be investigated further (G. C. Anawati in *MIDEO* 1, 1954, pp. 164-65).

2. *Ketāb al-enṣāf* (The book of fair judgment). It was drafted between 15 Day 397/19 December 1018 and 30 Kordād 398/7 June 1019, and this first draft was lost in Moḥarram, 421/January, 1030. The work was a detailed commentary on the Aristotelian corpus, including the Plotinian *Theologia Aristotelis*, in which Avicenna came to grips with the very texts and did not merely present their teachings in his own words. In a way it was the historical counterpart of the systematic *Ketāb al-Mašreqīyīn*. There he had presented his own systematic revision of Aristotelian philosophy without direct reference to or argumentation against his predecessors; here he juxtaposed the transmitted texts in the entire Greco-Arabic Aristotelian tradition, which he called that of the Westerners (*Maḡrebīyūn*), with his own systematic elaborations, which he attributed to the Easterners (*Mašreqīyūn*). The extant portions of the work consist of the commentary on *Metaphysics*, *Lambda* (ed. ʿA. Badawī, *Aresṭū ʿend al-ʿArab*, Cairo, 1947, pp. 22-33), and two partially overlapping recensions of the commentary on the *Theologia Aristotelis* (ed. Badawī, *Aresṭū*, pp. 37-74).

3. *Al-Taʿlīqāt ʿalā ḥawāšī Ketāb al-nafs*, (Marginal notes on *De anima*) (ed. Badawī, *Aresṭū*, pp. 75-116). The title is by the scribe of the MS in which the work has been preserved (Cairo, Ḥekma 6M), and describes the

provenance of the notes. They are comments written by Avicenna in the margins of his own copy of Aristotle's *De anima*, and were later transcribed cleanly and consecutively by the scribe of the MS, or his immediate source, who omitted the Aristotelian text. Although these notes follow the same principles of composition as the *Enṣāf*, they are not part of it; they were written either immediately before it and directly occasioned it by whetting the appetite of Avicenna's disciples for a similar but more extensive composition, or immediately afterwards, in partial compensation for its loss.

In these texts Avicenna wished to designate by a different name his revised systematization of theoretical knowledge as transmitted in the Aristotelian tradition in order to emphasize the more advanced level which the history of philosophy had reached through his efforts. The name he chose reflected appropriately his background in the East (*mašreq*) of the Islamic world, i.e., Khorasan, and the philosophical tradition he generated was accordingly Eastern, i.e., the Khorasani school of Aristotelian philosophy. This designation, however, appears to have met with little approval and generated even less interest among his disciples and colleagues (perhaps because not all of them were from Khorasan?), and Avicenna decided to abandon the idea. He stopped referring to the easterners as a live concept by about 422/1031, six years before his death; with the sole exception of a couple of bibliographical references in his private correspondence, there is not a single mention of them in any of his subsequent writings. Their absence is particularly noteworthy in the *Ešārāt*, a work in which he achieved the highest degree of independence from traditional models of presentation and discussion, but in which he claims, in the epilogue, to have presented neither Western nor Eastern philosophy, but just the truth (*ḥaqq*) and philosophical points (*ḥekam*).

In the context of Avicenna's own work, the significance of the concept of Eastern philosophy lies in displaying his attitude toward his philosophical achievement and toward his position in the history of philosophy, during a specific and limited period of his career (418/1027-422/1031). Variants of this attitude are also observable in other stages of his philosophical activity. As for the texts on Eastern philosophy, the loss of most of them has resulted only in the loss of variant reformulations of the same positions taken in other works. In substantial terms nothing seems to have been lost.

This impression is also reflected by Avicenna's immediate posterity. There is no reference to the whole issue of Eastern philosophy in what is known of the works of Avicenna's disciples, or, a few scattered bibliographical notes excepted, in subsequent philosophical tradition in the Islamic East, where the surviving fragments of the Eastern texts were available. Sohravardī, as a matter of fact, who read these fragments, rebuked Avicenna for taking in vain the name of the east for his revised Aristotelianism (*al-Mašāreʿ waʾl-moṭāraḥāt*, in H. Corbin, *Šihābaddīn Yaḥyā as-Suhrawardī: Opera Metaphisica et Mystica* I, Leipzig

and Istanbul, 1945, p. 195).

It was only in the West, both in medieval Andalus and contemporary Europe, where the fragments were not available until recently, that the creative imagination of some scholars, prompted by the suggestive name, the East, and unchecked by any documentation, fashioned visionary recitals about Avicenna's mysticism. Ebn Ṭofayl's *Ḥayy b. Yaqẓān* proved to be particularly misleading. Ebn Ṭofayl, for his own purposes, misinterpreted as a difference of substance the stylistic contrast which Avicenna drew in the prologue of the *Šefāʾ* between that book and the *Ketāb al-Mašreqīyīn*, and created the impression, through the whole tenor of his own introduction, that the Eastern philosophy has somehow to do with mysticism. The subtitle of his work *Fī asrār al-ḥekma al-mašreqīya*, (On the secrets of eastern philosophy) also contributed to this effect. The suggestion was not lost on contemporary European scholars. Ebn Ṭofayl's subtitle was appropriated at the end of last century by M. A. F. Mehren who used it arbitrarily as the Arabic title of his own edition of the last chapters of the *Ešārāt* and a number of smaller treatises (*Rasāʾel ... Ebn Sīnā fī asrār al-ḥekma al-mašreqīya*, Leiden, 1889-99). This created the unfounded notion that these works deal with Eastern philosophy. To compound the error, Mehren translated in the same volume his Arabic title into French as, *Traités mystiques ... d'Avicenne*, associating this time, again without any basis, Eastern philosophy with mysticism. Once it gained printed legitimacy in this fashion, the myth of Avicenna's mystical Eastern philosophy has since reappeared in a number of variations that bear no relationship to the extant Eastern texts and are irrelevant to Avicenna's thought.

Bibliography: Different theories have been put forward about Avicenna's alleged mysticism. The standard Catholic version of Avicenna's "natural" mysticism is that by L. Gardet, "La connaissance mystique chez Ibn Sīnā et ses présupposés philosophiques," *Mémorial Avicenne* II, Cairo, 1952, incorporated in a revised form in the same author's *La pensée religieuse d'Avicenne (Ibn Sīnā)*, Paris, 1951, pp. 143-96. There is a brief review of the theories on this subject by S. H. Nasr, *Islamic Cosmological Doctrines*, 2nd ed., London, 1978, pp. 191-95, and, in greater detail, by S. Gómez Nogales, "El misticismo persa de Avicena y su influencia en al misticismo español," *Cuadernos del Seminario de Estudios de Filosofía y Pensamiento Islámicos* II, Madrid, 1981, pp. 65-88. H. Corbin's own version of Avicenna's light mysticism is set forth in his classic, *Avicenna and the Visionary Recital*, New York, 1960. Corbin also gives a brief discussion of the history of scholarship on the subject on pp. 271 ff. A review of the various theories that have been put forward about the "Oriental" philosophy of Avicenna is given by S. H. Nasr in his *Cosmological Doctrines*, pp. 185-90; see also R. Macuch, "Greek and Oriental Sources of Avicenna's and Sohrawardi's Theosophies," *Graeco-Arabica* (Athens) 2, 1983, pp. 9-13.

The critical study of the question of Avicenna's Eastern philosophy was inaugurated by C. A. Nallino's "Filosofia 'Orientale' od 'illuminativa' d'Avicenna?," *RSO* 10, 1923-25, pp. 433-67, and continued by S. Pines, "La 'philosophie orientale' d'Avicenne et sa polémique contre les Bagdadiens," *Archives d'histoire doctrinale et littéraire du Moyen Âge* 27, 1952, pp. 5-37. For a full discussion of the question and the bibliographical details about the Eastern texts, as well as Avicenna's epistemological theory and the concept of *ḥads*, see D. Gutas, *Avicenna and the Aristotelian Tradition: Introduction to Reading Avicenna's Philosophical Works* (forthcoming).

(D. GUTAS)

vi. PSYCHOLOGY

Like his metaphysics, Avicenna's psychology or doctrine of the soul has an Aristotelian base with a strong Neoplatonic superstructure. This we can see already in his definition of the soul. While Aristotle defines the soul as an entelechy or form of an organized natural body, Avicenna interprets the term entelechy in the sense in which a pilot is the entelechy of the ship (*De anima*, Ar. text, p. 6.13ff.). This example we find already in Aristotle but Aristotle does not offer it as his doctrine.

Avicenna gives a proof for the substantiality of the soul that renders it capable of existing by itself apart from the body. This proof was famous in medieval times, in Europe also, and is called the "proof of the suspended man." Avicenna asks us to suppose a person to be born adult and suspended in a vacuum where there is no air to resist him and, finally, to suppose that the parts of his body are so situated vis-à-vis each other that no part can touch others, then in that case such a person will not affirm the existence of anything external to him nor yet of his own body but he will still say, "I am." This assertion of self-consciousness apart from the body is the basis upon which the existence of the soul as a purely spiritual being is established (ibid., p. 15.12ff.). The striking affinity of this proof with the Cartesian proof is unmistakable.

Avicenna's theory of knowledge exhibits the same character, namely an Aristotelian starting point and a highly neoplatonized superstructure. His theory of sense-perception, imagination, and intellect have all an Aristotelian point of departure. First of all, Avicenna elaborates on the basis of Aristotelian suggestions that knowledge comes about by abstraction (Rahman, *Avicenna's Psychology*, pp. 38ff.). In sense-preception, for example, the matter of the perceived object is left out, but the form of the object is perceived. The next step in abstraction is reached in imagination because imagination can preserve an image which is free from matter. Although perception is not free from material attachments, imagination is free even from material relationships and attachments. The final stage of abstraction is reached in conception because a concept applies indifferently to all the members of a species: It is completely abstracted from the particulars of that species and is therefore universal. Just as there are five external senses—vision, audition, touch, taste, and smell—so there are five internal senses. Avicenna seems to be the originator of this theory. The first of the internal senses is the *sensus communis* which fuses information coming from different external senses into an object or a percept. The second internal sense is what he calls imagination or, rather, the memory-image (*ḵayāl*). This is the faculty which contains the image of the object perceived after that object is removed from direct perception. Next comes the faculty which Avicenna calls *taḵayyol*, which literally means "imagining" as a verb. The function of this faculty is to combine images retained in the memory and to separate them from one another. Thanks to this faculty, fantastic images can be formed, for example, that of a golden mountain by combining that of gold with that of mountain. While much of the activity of this faculty, as we shall presently see, is non-rational and, in fact, recalcitrant to the control of reason, it plays a fundamental role in rational activity because thinking never comes about without the interplay of images.

The fourth faculty among the internal senses appears to be an innovation of Avicenna's because it is not found in any other earlier philosopher, either Greek, Christian, or Muslim. This faculty he terms *wahm* (ibid., p. 31.13ff.; *De anima*, pp. 166ff.) which is translated into Latin by the term *estimatio*. While the external perception perceives the physical form of the thing, its inner meaning is perceived by an internal sense; for example, when a sheep sees a wolf for the first time, it runs away in fear. Now the external perception of the sheep only perceives the form and the shape of the wolf. That the wolf is dangerous is conveyed to the sheep not by external perceptions but by an inner faculty.

Lastly, the fifth internal sense consists of a faculty which retains not the forms of perceived things, but their meanings and ideas as perceived by the faculty of *wahm*. This faculty, which is a storehouse of ideas and meanings rather than that of externally perceived forms must be clearly noted because it retains individual meanings, just as the faculty of memory preserves individual forms.

In his doctrine of intellection, Avicenna again starts from the Aristotelian distinction between the active and the passive intellect. The human intellect is at first only potential and is gradually actualized by the operations of the faculties of perception and particularly imagination. The faculty of imagination helps intellection in that the intellect compares and contrasts the images stored in the mind. Through this exercise of comparing and contrasting, the universal emerges from those particular images. This emergence of the universal from particular images is thanks to the action upon the human mind of the Active Intellect, which is the lowest in the series of ten incorporeal and cosmic intelligences below God. Avicenna emphasizes that the universal does not emerge *from* the images, but that due to the

activity of comparing and contrasting the images and combining them also with the meanings that are retained in the mind, the universal emerges into the human mind from the Active Intellect. Thus the mind's activity of comparing and contrasting the images is an exercise which prepares the soul for the reception of the universal intelligence from the cosmic intelligence. It is in this connection that Avicenna asserts that the mind has no storehouse or memory for the universal or abstract ideas as it has for particular forms and meanings. Therefore when the human mind wants to remember or recall universals, it reestablishes a contact with this universal Active Intelligence and receives the intelligible afresh, but whereas in the first instance it had to go through the whole exercise of camparing and contrasting images, this time it does not have to rehearse all the activity; its mere attention to the Active Intelligence is sufficient (ibid., pp. 116 ff.)

Avicenna is also the author of a famous doctrine about the intellect, according to which the human mind, when it contacts the Active Intelligence, receives from the latter a power which he calls "simple knowledge" (known in the medieval Latin West as *scientia simplex*; *De anima*, p. 243.9ff. This doctrine asserts that a person may be asked a question about a matter he had never thought of before a detail, yet he is sure that he possesses the ability to answer the question. This assurance that the person has that he can definitely answer the question in detail means that he knows the answer already—this is simple knowledge. But as he begins to answer the question of the questioner in detail, he comes to know it in a different way than in a simple unanalyzed form. The first kind of knowledge is the creative simple knowledge on the pattern of God's knowledge, while the second form of knowledge is termed by Avicenna "psychic knowledge" or discursive knowledge. This doctrine of the simple intellect exercised a good deal of influence on the development of Islamic mysticism as well.

Avicenna also strenuously denied the transmigration of souls (*Psychology*, chap. 14 with notes) because the soul, through its association and experiences with a certain given body, becomes permanently individuated. Hence, it can not pass into another body. Indeed, according to Avicenna, a particular soul comes into existence at a time when a certain body with a particular temperament comes into existence and is prepared to receive this soul. Therefore, there is an initial reciprocity that is further strengthened by individual experiences and, hence, any talk of one soul entering another new body, whether human or non-human, is absurd. But for Avicenna there is no survival of the body after its death at the end of this life (Rahman, *Prophecy*, pp. 42-44). He believed that the soul survives by itself. Those souls which have become intellectually developed do not need the body at all and therefore do not need to seek physical survival or indeed revival on the day of resurrection. Such intellectually developed souls form a kind of paradise wherein they enjoy each other. As for those human souls which have

not become intellectually fully developed and still need some sort of physical support, they will survive through their imagination because they are unable to go beyond the level of imagination. Such souls experience in the future life physical pleasures and pains just as described graphically in the Koran—the tortures of the fire of hell and the enjoyment of a physical paradise. Whether such souls have the opportunity of further development in the afterlife, Avicenna does not discuss.

Avicenna also formulated a comprehensive and elaborate theory of prophethood and prophetic revelation, several elements of which were taken from Greek thought and which had earlier been welded in some form by the philosopher Fārābī. (On the forms of prophethood see ibid., chaps. 1 and 2; Gardet, *La pensée*, chap. 4) Avicenna's prophetic faculty or power has three aspects: intellectual, imaginative, and practical. Whereas by the first, the prophet receives intellective revelation or wisdom, this results in the verbal revelation (for example, the Koran) thanks to the strong prophetic power of imagination which transforms intellective knowledge into moving images. Whereas the prophet shares the first with the philosopher, he is distinguished from the philosopher by the power of imagination. The third aspect of prophethood concerns the production of miracles, on the one hand, and the founding of the state and giving the law on the other.

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(F. RAHMAN)

vii. PRACTICAL SCIENCE

Avicenna's account of practical science is laconic and dispersed in minor tracts and in the opening and closing passages of his comprehensive encyclopedic works. The hope that he might some day write a comprehensive account of practical science, which he expresses at the beginning of the *Šefāʾ* (Healing), was never fulfilled. This was not because he was incapable of fulfilling it, but because it served his purpose, or so it seems, to remain laconic and to offer his views on the subject in bits and pieces, in a form lacking clarity, order, or completeness, and with intentions that remain inaccessible to many of his contemporaries and readers of his encyclopedic works such as the *Šefāʾ*. Such, for instance, was the case of the person who requested that Avicenna give a comprehensive, clear, and orderly account of the rational sciences, for whom he wrote the short treatise entitled (*Fī aqsām al-ʿolūm al-ʿaqlīya*) (On the division of the rational sciences).

Departing from his usual practice of confining himself to praising God as the bestower of the intellect, Avicenna begins and concludes this treatise with extended professions of faith and prayers for the prophet Moḥammad. The organization of this treatise is curious also in that it does not conform to the organization of the sciences presented in Avicenna's encyclopedic works. (These normally begin with logic, proceed to natural science and mathematics, and conclude with metaphysics, with a brief account of practical science as an appendage of metaphysics.) After defining wisdom and presenting its primary divisions (secs. 1-2), he presents the tripartite division of theoretical and the tripartite division of practical wisdom (secs. 3-4), concluding what appears to be the first part of the treatise. Then, and without having prepared the reader for what follows, he gives an account of the principal and subsidiary divisions of natural science, mathematics, and metaphysics, devoting two sections to each of these three theoretical sciences (secs. 5-10: the subsidiary divisions of metaphysics are knowledge of revelation and resurrection). One would expect this second part of the treatise to be followed by an account of the principal and subsidiary divisions of the three practical sciences. But Avicenna says nothing about these. Instead, he concludes with the statement that this part dealt with the principal and subsidiary divisions of wisdom, not just of theoretical wisdom, and proceeds to give an account of the instrument, logic, that leads to the acquisition of both theoretical and practical wisdom (sec. 11: this third part concludes with an account of rhetoric and poetry). Thus despite the weight given to the theoretical sciences (it is only in sec. 4 that practical science is treated in any detail) all three parts of the treatise conclude with things that are of primary practical political importance.

Avicenna restates the Aristotelian division of philosophic knowledge or wisdom into theoretical and practical sciences in a seemingly emphatic and positive fashion. This deserves particular attention, in view of the fact that his predecessor Fārābī—praised by Avicenna as "perhaps the most excellent" of his predecessors among the philosophers (Mobāḥaṯāt, p. 122.4)—had kept this Aristotelian division largely in the background and hinted at its problematical character. What, then, did Avicenna mean to achieve by reintroducing this perhaps concise and orderly division with the claim that it is clear, complete, and precise as well? And what are we to make of the additional claim, with which he concludes the treatise, that this division of wisdom into theoretical and practical rational sciences has made it apparent that none of them "contains what contradicts the [Islamic divine] Law" and that those who pursue these sciences and "deviate" from the path of the Law "err of their own accord, because of their incompetence and failing, not because the art [of philosophy or wisdom] itself requires it—the art is not responsible for them" (p. 118.9-12)? To see how Avicenna succeeds in removing all contradiction between any of the philosophic rational sciences and the Islamic Law, we need to take a closer look at his reformulation of the Aristotelian division of the sciences in general and at his new view of practical science and its relation to the religious Law.

At first sight Avicenna seems to contradict himself by presenting two incompatible views of practical science. In the first he holds to the notion that wisdom is one, not many; it may have many parts, but they all participate in and are directed toward the one wisdom, which is a theoretical art of inquiry by which man pursues two things: Knowledge of what all being is in itself and that kind of activity which is necessary, and only as far as it is necessary, to render his soul noble and perfect so as to become an "intelligible world" corresponding to the world of being and ready for the highest or ultimate happiness (pp. 104.13-105.3). The aims is one: Knowledge of the things that are. To pursue this man needs to know and do certain practical things that are indispensable if he is to achieve his aim. These necessary conditions of the pursuit of theoretical knowledge make him noble and perfect, not as such, but as an instrument, one may say, of theoretical inquiry. This practical science and the activity it points to have no independent end or a horizon within which goodness and nobility are ends in themselves; goodness and nobility are defined in terms of what is useful and necessary for the pursuit of theoretical knowledge. Practical life, whether man's life by himself or in association with others, is subordinated to theoretical life. The emphasis is clearly on private rather than public life; and ethics (knowledge of goodness and nobility) is somehow divorced from politics, which is not even mentioned in this context. This is one direction in which Avicenna moves. It emphasizes ethics and subordinates practical life to theoretical life. The code names are "ultimate" and "other-wordly" happiness, which mean the same thing as perfect theoretical knowledge of all the beings as far as this is possible for man.

The second direction emerges in sec. 4 (pp. 107.4-108.10) where Avicenna gives the divisions of practical wisdom. The point of departure is "human governance," which is divided into (1) single individual and (2) in partnership with others, which is subdivided into (a) the household and (b) the city. (1) Ethics now covers man's happiness here (his first perfection) as well as in the hereafter. This is said to be contained in Aristotle's Ethics. (2a) The aim of household management is a well-ordered life, which merely "enables man" (that is, places him in a position) to gain happiness (presumably both kinds); it is clearly subordinated to ethics and conceived as a preparatory stage that makes possible the moral habits and activities that make men happy in this and the other life. (2b) Politics deals with the classes of political régimes, rulerships, and associations, good and bad; how each is preserved, the cause of its disintegration, and how it is transformed. And although as part of practical wisdom political science aims at the "good" (vs. the truth), Avicenna does not say that it aims at "happiness," either directly as in the case of ethics, or indirectly, as in the case of household management.

Then he singles out "rulership" and divides it into "kingship" and "prophecy and the Law," stating that each is contained in two books written by Plato and Aristotle respectively. He insists that what the philosophers (Plato and Aristotle) mean by *nomos* (plur. *nomoi*) in their two books on the subject is precisely the *Šarī'a* (the religious divine Law) and the coming down of revelation; and he defends this philosophic view of the *nomoi* against a vulgar view, which is that the *nomos* is "nothing but a device and deceit." (In fact, this was not a "vulgar" view, but the view of those philosophers with whom Avicenna disagrees and whom he likes to call "vulgar people," e.g., the physician al-Rāzī.) According to the philosophers (Plato and Aristotle), *nomos* is the way of life (*Sonna*) and the norm (*meṭāl*) established by the coming down of revelation, which seems to be confirmed by the use of the Arabized form of *nomos*, *nāmūs*, as a name for the angel of revelation. The vulgar view assumed that the philosophers considered the *nomoi* (including prophecy and revelation) as "nothing but a device and deceit." Avicenna could have criticized this view by saying that the philosophers (Plato and Aristotle) did not speak about this kind of prophecy, revelation, and divine Laws. Instead, he counters it by assuming that this is exactly what Plato and Aristotle wrote about.

Now while it may be true that Plato and Aristotle did not write about this particular prophet or revelation or divine Law, there seem to be certain things about all prophecy, revelation, and the divine Laws which can be learned, that is, known scientifically, only in political science and nowhere else. The list which follows is important because it presents a program which Avicenna did not elaborate elsewhere in the same context: Political science, and no theoretical or practical philosophic or religious science other than political science, enables one to know the following:

(1) The necessity (*wojūb*) of prophecy and the human species' need of the divine Law (*Šarī'a*) for its existence, preservation, and final destiny. This ambiguous statement indicates that prophecy and the divine Law are necessary and indispensable for the very existence and preservation of human life (of the species), which seems absurd, yet it is confirmed by the Persian compendium written for the king 'Alā'-al-dawla, where Avicenna says that within political science, the science of the Law is the root and the science of the régime the branch (*Dāneš-nāma-ye 'alā'ī* [*Elāhīyāt*], chaps. 1-2). It can also mean that political science shows whether, to what extent, and for what reason prophecy and the divine Law are necessary, which may make better sense. Political science was said to deal with the classes of régims and rulerships. Two types of rulerships were cited: royal and prophetic. So the question whether and under what conditions prophecy (and the Law) rather than kingship is necessary or needed for man's existence and preservation, properly belongs to political science.

(2) The "wisdom" of the (particular) prescriptions or determinations (*ḥodūd*, cf. *'Oyūn al-ḥekma*, p. 16.10), both the ones common to all Laws and the ones that pertain to particular Laws, having to do with particular peoples and particular times. That is, why prescriptions in general, and why prescriptions should be different in different Laws, for different peoples, and in different times.

(3) It is through political science that one knows the difference between "divine prophecy and false claims to it." Avicenna does not explain how political science, whose subject matter is good and bad régimes and rulerships, can tell the difference between divine prophecy and false claims to it. After all, "divine" things are not the subject of political science, which is part of practical wisdom. He could have reserved this subject for divine science, but does not even mention it there. Nor does he explain on what basis political science can tell the difference between genuine and false prophecy, or whether all prophecy is "divine" prophecy, all revelation "divine" revelation, or all laws "divine" Laws.

Now political science as political science presumably makes known whether a political régime or rulership is virtuous or bad, how it is preserved, the cause of its disintegration, and how it is transformed. So presumably the only way it can tell the difference between "divine prophecy and false claims to it" is by whether or not the régime and rulership and laws are excellent, well made, and lasting. But surely one can not say that excellent régimes and divine Laws are necessary, required for the very existence and preservation of the human species; for ordinary régimes and laws can preserve it just as well. Is the conclusion, then, that what is necessary is prophecy and laws of any kind, good or bad, divine or false, provided they contain appropriate workable prescriptions? The only thing that is clear is that the answers to such questions are to be found in political science, in the writings of Plato and Aristotle, who wrote two books each on the kingship and the *nomoi* respectively.

On the surface it appears that Avicenna has concluded the account of practical science; he will now move to give an account of the principal and subsidiary divisions of the three theoretical sciences and an account of logic; unlike the theoretical sciences, practical science has no subsidiary divisions. Yet in fact the account of things practical, as against practical "wisdom" or "philosophy," is far from having been completed. To begin with, there are numerous references to what might be called the theoretical foundations of prophecy, revelation, and the divine Law in the principal divisions of natural science and divine science (secs. 5, 9). These include the "divine art" that underlies the overall order of nature and the immortality of the human soul (sec. 5); and the account of God's unity and attributes, the ranks and functions of the angels, and the overall order of the universe and its essential goodness. These matters, like everything contained in the principal divisions of the theoretical sciences, are all known by demonstration and with certainty.

The subsidiary divisions of the theoretical sciences, in

contrast, are not said to be known demonstratively and with certainty; in many cases their method is characterized as proceeding through guesswork (takmīn), recognition through signs (estedlāl), or simply as production or making ('amal) (pp. 110.10, 15 and 112.6-7). All the subsidiary divisions of the theoretical sciences can in fact be seen as applied or practical arts, and thus can be considered as subsidiary divisions of practical science as well. This is obviously the case in the practical arts that form the subsidiary divisions of natural science (such as medicine or astrology) and of mathematics (such as mechanical devices or musical instruments), but the case is perhaps not so obvious in the subsidiary divisions of divine science, to which we shall now turn.

All five principal divisions of divine science were said to be contained in Aristotle's *Metaphysics* and to be known with certainty by means of demonstration (114.8); neither of the two subsidiary divisions of divine science selected by Avicenna (he does not give an exhaustive account of these but only a selection introduced by men dāleka, p. 114.10, 16-17) are said to be know by demonstration or with certainty.

The first subsidiary division of divine science deals with revelation, prophecy, miracles, inspiration, and the angles of revelation, all of which are related or made to correspond to what was known demonstratively in the theoretical divisions of divine science, yet they are not to be found in Aristotle's *Metaphysics*. One can, however, find there certain things with which these matters can be identified or on the basis of which they can be explained. Nothing is said in this connection about the divine Law. This looks like "applied" or "special" metaphysics, where the general view of the universe found in Aristotle's *Metaphysics* (including, of course, Book *Lambda*) is used to show that revelation, miracles, and inspiration are possible. The main theme of this subsidiary division of divine science is not "what" these matters are, but "how" they take place, e.g., how the angel of revelation comes to be seen or heard.

The second subsidiary division of divine science deals with the "science of return" or the afterlife, a subject treated with unusual length in sec. 10 (pp. 114.16-116.2.) The reason seems to be this. As a rational science, the "science of return" can make known the immortality of the soul and the rewards and punishments awaiting it after death. But the rewards or punishments that await the soul after death are meted out, not only for holding true or false beliefs in this life, but for whether or not one has performed the good deeds "prescribed by both the divine Law and reason." But the divine Law makes known also the resurrection of the body and promises rewards and punishments in respect of both the soul and the body. Reason and the divine Law thus agree with respect to the immortality of the soul, but the divine Law provides in addition for the resurrection of the body and for bodily rewards and punishment in the hereafter, something that is in God's power to do if and when He wills, but that reason can not prove or show its necessity. Avicenna goes further. He suggests the following formula for whatever reason can not prove:

"Whatever reason can not assert that it exists or prove its necessity (as far as reason is concerned, it is only possible), then it is prophecy that settles the question whether it does or does not exist" (pp. 115.16-116.1).

But this assumes a true prophecy rather than false claims to it, and we recall that the difference between true prophecy and false claims to prophecy is one of the tasks of political science, which is a practical science. Political science must first judge whether the divine Law legislated by the prophet is a true divine Law revealed to a genuine or truthful prophet, after which, it seems, it must admit the validity of whatever is legislated by the prophet, including things that reason can not know, and this seems to apply in particular to the resurrection of the body and to bodily rewards and punishments in the hereafter. It is perhaps not necessary to add that, as a rational science, practical science must judge the truthfulness of prophecy through the character of the prophet's legislation insofar as it promotes the welfare of the city, of the souls and bodies of the citizens in this world, and their ultimate or higher happiness—the happiness of their souls—in the hereafter, rather than insofar as it promotes the happiness of their bodies in the hereafter. And since what promotes the happiness of the soul in the hereafter (what Avicenna calls the higher or nobler happiness of man) is correct beliefs and good deeds in this world, practical science can only judge the truthfulness of prophecy by whether and to what extent the prophet's Law promotes correct beliefs and good actions in this world.

The non-demonstrative account of the subsidiary or applied divisions of divine science points to the complex relationship between the theoretical and practical rational sciences on the one hand and the beliefs and practices legislated in the divine Law on the other. The beliefs legislated by the divine Law find their counterparts in the theoretical sciences, which can demonstrate some of them, but not all, e.g., it can not know anything about the resurrection of the body and bodily rewards and punishments in the hereafter. The practical prescriptions of the divine Law find their counterpart in practical science (and in the subsidiary divisions of the theoretical sciences). But practical science can not make known the entire wisdom of the prescriptions common to all divine Laws or of those that pertain to a particular divine Law legislated for a particular people at a particular time. The divine Law contains beliefs and practices that are not accessible to reason, largely because they deal with bodily affairs or with particular prescriptions that are not rational or can not be known by reason or with certainty. Nevertheless, they seem to be essential to the welfare of the city and to man's life on earth, where the soul does not exist independently of body and of bodily concerns.

The treatise *On the Divisions of the Rational Sciences* culminates in a third part that gives an account of logic, which tries to explain the method that must be employed in all investigations, both the ones that admit of demonstration and the ones that do not, such as arguments in favor of what is praiseworthy and

arguments against what is blameworthy, the useful ways of addressing the multitude, and imaginative representations—that is, dialectic, rhetoric, and poetry. In this way what is not accessible to reason becomes accessible to methods of investigation which, while not fully rational and to some degree even based on exploiting the human passions, are not wholly devoid of rational elements.

All this points to the fact that Avicenna was fully aware of the range of investigations in which practical science can engage following the models presented in the political works of Plato, Aristotle, and Fārābī. Yet he chose not to follow these models but to chart a new path that assumes the validity of these models and applies their conclusions to particular aspects of the Islamic divine Law. To do so, he had to move backwards, as it were, from the beliefs and practices prescribed by the divine Law to the spiritual, moral, and rational purpose and meaning that lay behind them. To perform this task safely and effectively, he found it prudent to abandon the Platonic and Farabian views of political science as the architectonic practical science if not the architectonic science simply, and revive the practical Aristotelian division of wisdom or philosophy into theoretical and practical sciences.

Taking his cue from the concerns of the divine Law with the body and bodily matters, Avicenna revived another ancient (Platonic, Aristotelian, as well as Farabian) view of political science. This view emphasized the usefulness of political science in respect of promoting the welfare of the bodies (*maṣāleḥ al-abdān*) and the preservation of the human species (*'Oyūn al-ḥekma*, p. 16.14). At first sight, this view seems to distinguish political science from ethics, which is said to be useful in purifying the soul. But purifying the soul means freeing it from bodily concerns, and the virtues and vices with which Avicenna deals in his ethical writings involve the control of the soul's desires, passions, etc., which are occasioned by the soul's connection to the body. Further, purification does not necessarily mean complete detachment from the body, an event that does not occur until the final separation with the death of the body.

Nevertheless, Avicenna's sharp division in practical science between the human governance that pertains to a *single* individual (ethics) and that which does not pertain to a single individual but takes place through partnership (household management and politics) points to the importance he placed on private perfection and thus to the subordination of practical science as a whole to the pursuit of theoretical knowledge. This, however, was enough to initiate the decline of political philosophy among those who maintained the Islamic philosophic tradition in the East until modern times, with the result that the Muslim community finds itself meeting the practical political challenge of the modern world with only a faint memory of an indigenous political-phylosophic tradition.

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(M. MAHDI)

viii. MATHEMATICS AND PHYSICAL SCIENCES

Introduction. What is understood by mathematics and physical sciences in this context is what Avicenna himself referred to in his encyclopedic work the *Šefā'*, as the mathematical sciences, which included both mathematics and astronomy, and the physical sciences (*ṭabī'īyāt*), which included the usual Aristotelian disciplines designated as the Physics, the Heavens, Generation and Corruption, Meteorologica (the fourth part of which is treated separately under the title *al-fe'l wa'l-enfe'āl*), the Soul, the Plants, and the Animals.

A few other works have been attributed to Avicenna in the literature such as: *ḥall-e moškelāt-e mo'īnīya* (Anawati, p. 227), *taḥrīr al-majestī* (Mahdawī, p. 263), which can now be definitely determined as being by later authors, the first being the work of Naṣīr-al-dīn Ṭūsī (d. 1274) and the second being the work of Mo'ayyad-al-dīn 'Orżī (d. 1266).

Mathematical works. The third treatise (*jomla*) of the *Šefā'* is devoted to the mathematical sciences. The Avicennian division is that of Aristotle, and thus the mathematical sciences included four parts (*fann*), namely, Geometry, Arithmetic, Music and Astronomy.

The two major works in this treatise are the one devoted to geometry and that devoted to astronomy. The Arithmetic and the treatise on music are simply renditions of the elementary principles of these two disciplines and need not concern us here, except to say that in the Arithmetic, Avicenna manages, in his eclectic style, to include results reached by earlier mathematicians such as Ṯābet b. Qorra and others. In the same book he also combines material from Euclid's *Elements*, Diophantus' *Arithmetic*, and the contemporary algebraists. The influence of the latter is especially significant, for it reveals the impact of the Arabic discipline of algebra on Greek arithmetical theory.

Geometry. In the part of Geometry, Avicenna wrote what could be properly called a *taḥrīr* of Euclid's *Elements*, in spite of the fact that he called his work an abridgment (*ektesār*), thus feeling free to reorganize the material, to supply alternate proofs for theorems, to restate the conditions and the theorems themselves, and to add any "corrections" that he saw fit. The editor of this part of the *Šefā'* has established beyond doubt that Avicenna although staying close to the order of the *Elements*, had taken the liberty to rearrange the theorems, to combine proofs, to add new ones, and change the statement of the contents to agree with his own style and taste.

All this deliberate "tampering" with the text of the *Elements* should, however, be understood in terms of

the Arabic translations of the *Elements*, which, from very early times, included the addition of material that was thought to belong to it, such as the two treatises fourteen and fifteen, attributed to Esqlābes (Hypsicles), but actually authored by Hypsicles and an anonymous author respectively, and not by Euclid. In addition to these translations the Arabic tradition also included commentaries that were sometimes composed of lengthy explanations of the text together with an attempt to put the material in a historical perspective. These commentaries also "took liberties" with the text in the sense that they grouped together theorems and proofs that were seen as closely related, and at times omitted other proofs or parts thereof, because they were thought to be redundant. Avicenna's work falls within this tradition and is actually closer to a *taḥrīr* than to an *ektesạ̄r*.

As an example of the free use of the text and the additional remarks appended to it, we note the additional definition of the irrationals given by Avicenna at the beginning of book ten of his version of the *Elements*. After defining the commensurable and the incommensurable in almost the same terminology as the one used by Euclid, Avicenna goes on to say that "there are no magnitudes that are irrational or rational (*asamm* or *monṭaq*) by themselves (*be-dātehe*), but are so only in relation to the assumed (unit) magnitude. If it (i.e. the magnitude) is commensurable with that (unit) magnitude then it is rational, otherwise it is irrational. This same irrational could become rational in relation to another (unit) magnitude; and the original (unit) magnitude would then become irrational." There is no such comment in the Euclidean text or in the Arabic translations of that text, it is obviously an interpolation by Avicenna. It shows the degree to which the Euclidian text was being reorganized and could very well show the indebtedness of Avicenna to the earlier commentators who may have elaborated the text at this point.

Astronomy. Avicenna's works on astronomy are of the same nature as his work on geometry. In this part of the *Šefāʾ*, he gives his own version of what he thought were the contents of Ptolemy's *Almagest*. The Avicennian text is again called *talkị̄ṣ* and, like the *ektesạ̄r* of the *Elements*, it contains a rearrangement of the material, an abridgment, and several explanatory notes. Treatises nine, ten, and eleven of the *Almagest* are treated by Avicenna in one chapter, for they all deal with the particulars of the dimensions of the models that Ptolemy proposed for the planets. Many of the lengthy proofs of the *Almagest* are summarized, and they are all recast in a simplified language, without loosing any of the mathematical rigor of the *Almagest*. The observations that were used by Ptolemy, for example, to determine the eccentricities of the upper planets Saturn, Jupiter, and Mars are grouped together by Avicenna at the beginning of the fourth chapter of his unified treatise, instead of being spread in X, 7 (Mars), XI, 1 (Jupiter), and XI, 5 (Saturn) as in the *Almagest*.

On the other hand, the method used by Ptolemy to determine the eccentricities of the models of each of these upper planets is essentially the same for each one of them. It involves a rather sophisticated iteration method. Once this method is mastered for the case of Mars, one needs no longer repeat it for the other two. Ptolemy, however, repeats this iteration method for each one of these planets in essentially the same terms although in somewhat shortened form. Avicenna, on the other hand, must have seen that the theoretical contents of these procedures used for each planet are the same; the only variation being really in the details of the observations leading to the variation in the computed results for each model. As a result, he must have felt that the Ptolemaic exposition contains some redundancy and hence can be better restated. This would then explain why he treated these three treatises, namely, nine, ten, and eleven, in one chapter.

The same method is followed by Avicenna throughout the book, and one could easily follow the Ptolemaic results from the Avicennian exposition of the *Almagest*. The only parts of the *Almagest* that are not included here are the numerical tables and the star catalogue.

From another perspective, the theoretical and mainly philosophical foundation of the *Almagest* is not touched upon by Avicenna throughout the whole book. These theoretical issues had motivated other Islamic astronomers, e.g., the contemporary of Avicenna, Ebn al-Haytam, to write a full treatise devoted to their analysis and refutation. Ebn al-Haytam's treatise *al-Šokūk ʿalā Baṭlamyūs* managed to isolate what was perceived to be a contradiction in Ptolemaic astronomy in the sense that that astronomy did not harmonize the mathematical and the physical aspects of the world. This does not mean that Avicenna was not interested in these issues or that he did not notice them.

In a treatise written by his student Abū ʿObayd Jūzjānī about the contradiction in Ptolemaic astronomy that came to be known as the problem (*eškāl*) of the equant, the student says that his teacher Avicenna had even succeeded in solving at least this Ptolemaic contradiction, namely, the problem of the equant. The student further claims that he had asked Avicenna about the veracity of that claim, only to be told by his teacher that it was indeed true, but that he wanted the student to find the solution for himself. The student proceeds to observe that he, i.e., the student, was the first to succeed in obtaining a mathematical solution for the problem of the equant. Here are the student's own words: "When I asked him (i.e., Avicenna) about this problem (i.e., that of the equant), he said: 'I came to understand this problem after great effort and much toil, and I will not teach it to anybody. Apply yourself to it and it may be revealed to you as it was revealed to me'. I suspect that I was the first to achieve these results." However, a closer analysis of the student's work, which was published recently, shows that he too was not quite successful in establishing a valid solution of the problem.

Should this anecdote be true, then one must admit that by our modern standards the moral attitude of Avicenna left a lot to be desired. But what it also shows

is the fact that within the circle of Avicenna, he and his students were at least discussing these same issues, which, as we have seen, had motivated Ebn al-Haytam to devote a special treatise to them, and thus to formulate the main program of research for later Islamic astronomers for centuries to come, extending well into the fifteenth century as far as we can now tell.

As for the parameters that were reported in the *Almagest* and were later found to be contradicted by observational facts, we find Avicenna discussing them in an appendix that is usually attached to his *talkīṣ*, and which also included what Avicenna thought were defects in Ptolemaic astronomy. In its introduction, he says that one ought to contrast the statements of the *Almagest* with those of the rational part of natural science. One must further show the method by which the motions of the planets could take place. Thirdly, Avicenna reports some of the observational results reached after the writing of the *Almagest* and still in agreement with the theoretical statements of the *Almagest*.

In the body of this appendix, he begins by showing how it is possible for a sphere embedded within another sphere to move by its own motion in spite of the fact that it has to follow the surrounding sphere in the latter's motion. But if both spheres have the same axis, then it is impossible for the inner sphere to move by its own motion, and to move accidentally with the motion of the surrounding one in such a way that the two motions are opposite in direction. He then analyzes the two cases when the two axes are not identical, namely, (1) when the two axes intersect at the center or (2) when they do not.

Avicenna then takes up the issue of the observational results reached after the writing of the *Almagest*, which affected the validity of the *Almagest* statements themselves. In this category, he takes the parameter for the inclination of the obliquity, determined by Ptolemy to have been 23;51 degrees, and reports the results reached by the astronomers working during the reign of the caliph al-Ma'mūn (813-833) as being 23;35. He then claims that it had "decreased" after that by some one minute, and that he himself had observed the inclination and found it in his own days to be less than that by another amount equal to half a minute approximately. These results for the obliquity of the ecliptic were much closer to the true value, as derivable from modern computations, than the value found by Ptolemy.

The next two interrelated parameters of precession and solar apogee were also noted as having been found to be at variance with the results found by Ptolemy. In the first case, Ptolemy found precession to be one degree in one hundred years while the more precise value, which was determined afterwards and was reported by Avicenna, was found to be one degree in every sixty-six years approximately. This also determined the motion of the solar apogee, which was found by Ptolemy to have been stationary at five degrees of Gemini, but was found by later astronomers to have been moving primarily with precession. By Avicenna's time, the solar

apogee must have been around the eighteenth degree of Gemini, instead of the fifth.

The size of the solar disk was also found to be less than the size computed for it, "with some approximation," by Ptolemy.

Avicenna concludes this appendix by stating that other parameters were also at variance with the results reached by Ptolemy, but that he had no observational results to determine them with any certainty. This means that, although there are claims in Avicenna's works of direct observations, he did not seem to have had access to a functional observatory, nor did he seem to have had a systematic program of observations that he wished to complete.

Finally, Avicenna's *talkīṣ* of the *Almagest* includes a very curious note about his alleged observation of the disk of Venus being like "a mole on the face of the sun." There are several citations in medieval Arabic sources of the transit of Venus, and this would have been just another one of them, had it not been for its crucial importance in the argument for the relative order of the planetary spheres. The problem had already started with Ptolemy when he could not cite a positive proof for the order of the planetary spheres, and finally opted for a proper order that placed the sun in the middle with both Venus and Mercury as inferior planets, while Mars, Jupiter, and Saturn were taken as the superior ones. The planetary distances, which were computed by Ptolemy for each of these spheres included an approximation that allowed someone like Jāber b. Aflaḥ (fl. first half of the 12th century) and later Mo'ayyad-al-dīn 'Orżī (d. 1266) to conclude that according to the Ptolemaic computations Venus should fall above the sun, and hence could not be seen "as a mole on the face of the sun."

Whether Avicenna had actually seen Venus in transit or not is immaterial, for he was then quoted by later astronomers as confirming Ptolemy's arrangement of the planets. Among those astronomers who quoted this observation specifically for that purpose were the thirteenth-century astronomer Naṣīr-al-dīn Ṭūsī (d. 1274) and the much later astronomer Cyriacus (ca. 1482), to name only two.

Physical Science. We shall confine ourselves to an account of the disciplines treated by Avicenna in the vast field covered by natural science: alchemy, astrology, and theory of vision.

In his explanation of the theory of metal formation in the *Tabī'iyāt* section of the *Šefā* (Cairo ed., part 5, chap. 5, pp. 22f.), Avicenna proposes two different theories: (1) the familiar Aristotelian theory of condensed vapors as being responsible for the formation of the various metals, and which is followed immediately by (2) the mercury-sulphur theory, commonly attributed to Jāber b. Ḥayyān (8th-9th century) (E. J. Holmyard, *Alchemy*, London, 1957, repr. 1968, pp. 75, 94). In the mercury-sulphur theory, Avicenna argues successfully for the production of all metals through balancing the relationship of the Aristotelian qualities—hot, dry, wet, and cold—in the substances

mercury and sulphur. "If," he says, "the mercury be pure, and if it be commingled with and solidified by the virtue of a white sulphur which neither induces combustion nor is impure, but on the contrary, is more excellent than that prepared by the adepts (i.e., Alchemists), then the product is silver." (Holmyard and Mandeville, *Congelatione*, p. 39). "If," he continues, "the sulphur besides being pure is even better than that just described, and whiter, and if in addition it possesses a tinctorial, fiery, subtle, and non-combustive virtue—in short, if it is superior to that which the adepts can prepare—it will solidify the mercury into gold" (ibid.).

One would have expected that once Avicenna had recognized the difference between silver and gold as a difference in the qualities of the two substances—one requiring only a purer sulphur than the other—and not the substances themselves, he would have followed the path of the alchemists who simply held the same opinion. But in a strange twist, Avicenna went on to say: "As to the claims of the alchemists, it must be clearly understood that it is not in their power to bring about any true change of species" (ibid., p. 41), thereby redefining the metals as separate concrete species as distinct as the species horse and dog, as one of his critics best put it (ibid., p. 7).

This generally confused argument of Avicenna against alchemy was duly noted and attacked by Togrā'ī (d. 1121). And as much as Ebn Kaldūn would have wanted Avicenna's attack against alchemy to have been successful, he nevertheless found himself obliged to agree with Togrā'ī's criticism of Avicenna's argument (*Moqaddema* III, pp. 273-74).

On the subject of astrology, he was not much clearer, in spite of the fact that he had written a treatise especially devoted to the attack of astrology (*Resāla fi ebṭāl aḥkām al-nojūm*). After classifying astrology as a refutable science, he went on to say that although it was true that each planet had some influence on the earth, it was doubtful whether one could tell of the nature of this effect. The next argument that he put forth was that the astrologers were incapable of determining the exact influence of the stars, although he agreed with them that according to what he called "the scientists" each star did have an influence on the earth.

In essence, Avicenna did not refute astrology, but denied man's ability to know of the effects of the stars on the sublunar matter. With that, he did not refute the essential dogma of astrology, as someone like the Ash'arite Bāqellānī, close to a generation earlier, did, but only refuted our ability to know the principles of that science. If one developed better methods and techniques of gauging the influence of the stars on man's life and earthly events, then Avicenna would, in principle, have accepted that that would have been possible.

Avicenna's theory of vision is an explicit restatement of the Aristotelian theory. In terms of intramission versus extramission, this theory occupied the middle grounds. For neither Aristotle nor Avicenna after him could subscribe to the extramission theory by accepting the ability of the eye to issue forth a ray that will have to reach as far as the stars to explain their visibility. For similar reasons, they could not accept the ability of the eye to receive anything from the outside to explain its visibility. The middle ground would therefore be that vision occurs in the medium that separates the eye from the visible object. For vision to take place, the object must have the ability to affect the medium separating it from the eye; and this medium must be transparent; and the perceptive faculty in the eye must sense this change or affectation.

In his treatise *On The Soul*, Avicenna states the problem in the following terms: "Among them (i.e. the doctrines of vision) is the doctrine of the one who thinks that, like other sensed objects, which are not perceived (*edrāk*) due to anything coming out toward them from the senses and touching them or by sending a messenger to them, so is vision. It takes place, not by the issuing of any ray whatsoever that meets the seen (object), but rather by the transmission of the form (*ṣūra*) of the seen (object) to the eye (*baṣar*) through the transparency (*al-ṣaffāf*) that delivers it" (*Šefā'*, *Tabī'īyat*, *Nafs* III, 5, p. 102).

Later on in the same treatise, he elaborates further the nature of the visibility of the lit objects and the media that separate them from the eye, by saying: "It is characteristic of the body that is bright by itself, or the one that is lit and colored, that it imprints (*yaf'al*) upon the body facing it—if it were capable of receiving the form (*šabaḥ*) in the same way the eye is, and having a colorless body between them—an effect, that is, a form (*ṣūra*) similar to its own form, without having any effect on the intermediary, for it (the intermediary) is transparent and is incapable of reception" (ibid., p. 128).

This terminology is indeed very reminiscent of the Aristotelian version of the theory of vision as it was expressed in so many words in *De anima*, and in *Parva naturalia*. In *De anima*, "Seeing is due to an affection or change of what has the perceptive faculty, and it can not be affected by the seen color itself; it remains that it must be affected by what comes between" (419a.19). In the *Parva naturalia*, "vision is caused by a process through this medium (that separates the object from the eye)" (438b.4).

In Themistius' commentary on *De anima*, which was available in Arabic, vision is explained as "the ability to accept the essence (*ma'ānī*) of the colors that are in the transparent medium that is separate from it (i.e., vision)" (Themistius, *De anima* 98.12).

With this understanding of Avicenna's explanation of the theory of vision, it is not surprising to find Roger Bacon classifying Avicenna together with Ebn al-Haytam (Alhazen) and Ebn Rošd (Averroes) as the Arab philosophers who were opposed to the theory of the extramission of light (*Opus maius* V, 1, Distinction 7, chap. 3-4).

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of Y. Mahdawī, *Fehrest-e noskahā-ye moṣannafāt-e Ebn Sīnā*, Tehran, 1333 Š. /1955.

A critical edition of the various parts of Avicenna's *al-Šefā'* was published in Cairo from 1952 to 1983 under the general editorship of Ebrāhīm Madkūr. The critical editions of the mathematical and the physical works used in the present survey are those produced by this project.

For elementary treatises on music and arithmetic, the reader is refferred to the French translation of the *Dāneš-nāma, Le livre de science* II, by M. Achena and H. Massé, Paris, 1958. See also the study of this treatise presented by R. Rashed, "Mathématiques et philosophie chez Avicenne," presented at the Millenniary Colloquium of Avicenna in New Delhi, 1981.

For the work of Avicenna's student Abū 'Obayd Jūzjānī on the problem of the Ptolemaic equant, see the edition, translation and commentary by G. Saliba, "Ibn Sīnā and Abū 'Ubayd al-Jūzjānī: The Problem of the Ptolemaic Equant," *Journal for the History of Arabic Science* 4, 1980, pp. 376-403.

Avicenna's note on alchemy is in the fifth chapter of the first treatise of his *Meteorologica*, which itself is the fifth part of the *Ṭabīʿīyāt*. It was translated by E. J. Holmyard and D. C. Mandeville, in *Avicennae De Congelatione et Conglutinatione Lapidum*, Paris, 1927.

The treatise on astrology was published by H. Z. Ülken, *Ibn Sīnā Risāleleri* 2, Istanbul Üniversitesi Edebiyat Fakültesi Yayınlarından, no. 552, 1953, pp. 49-67, but was already studied by M. A. F. Mehren, "Vue d'Avicenne sur l'astrologie...," *Le Muséon* 3, 1884, pp. 383-403.

(G. SALIBA)

ix. MUSIC

Islamic writings on music are often theoretical treatises concerned with the analysis of pitch and duration, the constituent elements of melody. They are conceived less as descriptive accounts of contemporary practice than as systematizations of possible structures, utilizing, in the case of pitch, mathematical formulations derived from the Greek legacy. Among the most impressive examples of such writings are the relevant chapters in Avicenna's *Ketāb al-najāt, Dāneš-nāma-ye 'alāʾī*, and *Ketāb al-šefā'*, where music is considered as one of the mathematical sciences (the medieval *quadrivium*).

Not unexpectedly, matters of incidental relevance occur in other works also. Thus the *Resāla fi'l-nafs* contains a passage on the perception of sound (*ZDMG*, 1875, pp. 355-56); the first chapter of the *Resāla fī makārej al-ḥorūf* concerns itself with the physics of sound production; and the *Qānūn fi'l-ṭebb* discusses the pulse by analogy with musical proportion conceived, interestingly, not only in terms of rhythm but also of intervallic relationships (ed. Cairo, 1294/1877, I, pp. 125-26; see also the parallel passage in *Ragšenāsī*, ed. M. Meškāt, Tehran, 1370/1951, pp. 31-36). There is,

further, a brief definition of the scope of the science (*'elm*) of music in *Fī bayān aqsām al-ʿolūm al-ḥekmīya wa'l-ʿaqlīya* (BM. MS. Add. 7528, fol. 44v).

Nevertheless, any assessment of Avicenna as a theorist of music must concern itself essentially with the chapters on music in the *Najāt, Dāneš-nāma*, and *Šefā'*, and for our purposes they may be considered together, as representing more or less extensive versions of the same analysis. The expositions in the *Dāneš-nāma* and in the *Najāt* (which also occurs separately, with a few minor omissions, as the *Resāla fi'l-mūsīqī*) may be regarded as Persian and Arabic versions of the same text, and they contain virtually nothing that is not examined in greater depth in the *Šefā'*. The nature and quality of Avicenna's treatment of the subject may thus best be demonstrated by specific reference to this work, presenting as it does the most detailed theoretical analysis to appear between the *Ketāb al-mūsīqī al-kabīr* of Fārābī (d. 339/950) and the treatises of Ṣafī-al-dīn Ormavī (d. 693/1294).

Avicenna's general approach in the *Šefā'* is, not unexpectedly, similar to that of Fārābī. (The scope is undeniably narrower, but his formulations are sometimes more succinct and his organization of material more rigorously logical.) Noteworthy among the introductory remarks are peremptory dismissal of the doctrine of ethos (prominent in Kendī [d. ca. 260/874] and central to the Ekwān al-Ṣafā' [second half of the fourth/tenth century]), and an interesting discussion of the nature of sound viewed first functionally (as a signaling device aiding, ultimately, the survival of the species) and then as a means of expression with, in its more strictly musical form, a particular esthetic potential. The main body of the chapter then falls into two parts in accordance with the initial definition of the subject as a science concerned with notes (*naġam*) and the times separating them (*al-azmena al-motakallela baynahā*), its ultimate goal being knowledge of compositional procedures (*kayf yoʾallaf al-laḥn*).

The first part, dealing with notes, begins with a discussion of the physical causes of differences in pitch, and provides definitions of the basic concepts of note, interval (*boʿd*), genus (*jens*), and group (*jamāʿa*), the last three of which are then amplified in subsequent sections. Intervals are handled in terms of the mathematical ratios by which they may be represented, and are ranked according to their relative degrees of consonance. Two categories are recognized. The first is divided into large (octave), medium (fifth and fourth), and small (the series of superpartial intervals from the major third down to an approximate quartertone), with the small being subject to a further threefold division. The second consists of combinations of the above (e.g., octave plus fourth). The mathematical emphasis is equally apparent in two further sections dealing respectively with the addition and subtraction of intervals and their doubling and halving, and culminates in the extensive survey of the genera or tetrachord types. An initial discussion of the esthetics of different interval sizes considered in relation to melodic function gives pride of place to the class of

small intervals, and these are then variously combined into 16 tetrachords (yielding a possible 48 permutations in all) grouped according to the usual categories of strong (*qawī*), chromatic, and enharmonic. Here, oddly, Avicenna reverses the normal terminology, calling the chromatic *rāsem* and the enharmonic *molawwan*. The first part ends with an outline of the notion of group, essentially the various combinations of tetrachords and whole-tones within the Greek two-octave Greater Perfect System, and with a brief schematic survey of elementary types of melodic movement.

The material elaborated in the course of this analysis should not be thought of as constituting a description of the modal structure of the contemporary Arabo-Persian musical system. It is explicitly stated, for example, that the chromatic and enharmonic tetrachord species portrayed in such detail were not in normal use. We are thus presented here not with the results of empirical observation, but with a sophisticated adaptation and development of material derived from the Greek theorists. In the less technical areas there are, predictably, Aristotelian echoes, and Avicenna himself refers to Euclid and to the more important figure, in musical theory, of Ptolemy. While problems remain with regard to the way in which the material was transmitted, there are fewer difficulties in identifying the ultimate sources, and a comprehensive survey of these may be consulted in the appendix to D'Erlanger's translation of the music chapter in the *Šefā'* (*La musique arabe* II, pp. 258-306).

Seemingly less remote from contemporary practice, even if just as schematic, is the second major part, on rhythm (*īqā'*). Nevertheless, it is only at the end that some indication is given of which particular cycles were in current use: The main body of this section, for which Fārābī is again the model, presents a set of possible structures in terms of which rhythms could be formulated. Greek influence recedes, and the main analytical tools are derived rather from the Arab science of prosody, so that there is nothing unexpected in finding certain sequences discussed in terms of their varying suitability for verbal as against instrumental articulation, or the inclusion (specifically in the *Šefā'*) of a section devoted to prosody. The theoretical introduction begins with the notion of a basic recurring pulse to which can be related the concept of a minimum (indivisible) time unit, defined in articulatory (prosodic) terms as CV (*ḥarf motaḥarrek*) and symbolized as *ta*, and alternatively in relation to the circular physical movement of a player's hand between one percussion and the next. Discussion of the maximum possible number of time units between two precussions involves psychological considerations, the definition being that it must not be so great as to undermine the subjectively perceived relation between them. With regard to the structure of the rhythmic cycles, an immediate distinction is drawn between conjunct (*mowaṣṣal*) and disjunct (*mofaṣṣal*). The former, generically termed *hazaj*, are speedily dismissed, being equated with the basic recurring pulse (in different tempi), and attention is focused on the more flexible and complex patterns of the latter.

Each cycle is analysed as a set (*dawr*) of primary percussions separated from the next set by a disjunction (*fāṣela*). The number of primary percussions ranges from two to six, distributed over two to ten time units (sets with more time units are mentioned, only to be rejected as too long). Alterations to which the set may be subject involve the elimination of percussions (with or without deletion of the related time unit) and adding secondary percussions to otherwise unmarked time units, this latter feature being associated particularly with the slower rhythms. It should be noted, too, that the disjunction is also a variable. A given rhythmic type could thus comprise a number of cycles differing not only in the internal patterning of percussions but also in the total number of time units.

It is in the briefer final section that attention is turned more specifically to aspects of contemporary practice. The opening passage on the process of composition is an essentially abstract formulation, but includes nevertheless references to such techniques as trills and glissandi, and was to have ended with a specimen melody in *hazaj* rhythm, the notation for which, if it ever existed, has unfortunately failed to survive. There follows a short survey of instruments in which chrodophones figure prominently, being divided organologically according to both the way of mounting the strings (thus contrasting, e.g., harps and zithers) and the way of playing them: stopped or free, plucked or bowed. Aerophones are differentiated by whether the air stream passes through a hole, across a free beating reed, or is produced by means of an air reservoir. Only one (hammered) percussion instrument is mentioned, those of unturned pitch being ignored. Avicenna gives finally a fretting for the lute, called both *'ūd* and *barbaṭ* (details in Farmer, *Lute scale*, and Manik, *Tonsystem*, pp. 47-52), and then (in the *Šefā'* only) defines, largely in terms of that fretting, the intervallic structure of the more common melodic modes of his time. These show an interesting transitional phase between the early diatonic system and that described by Ṣafī-al-dīn; thus alongside purely diatonic modes are found others utilizing, in addition or exclusively, genera containing three quarter-tone intervals (associated with the *wosṭā zalzal* fret) and including, Arabized as *mostaqīm*, the earliest recorded version of the mode *rāst*.

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(O. WRIGHT)

x. BIOLOGY AND MEDICINE

Introduction: Avicenna between Aristotle and Galen. At the time of Avicenna natural philosophy and medicine overlapped, sharing a large area of the field that today we call biology. But they were two distinct traditions, in the important sense that each had its own literature and leading authorities, primarily Aristotle (Arestātālīs) for philosophy and Hippocrates (Boqrāt) and Galen (Jālīnūs) for medicine.

Galen, whose dominance of medicine was nearly complete, had differed sharply with Aristotle on some questions, the most central of which was whether the powers that control animal life have one single source (the heart, as Aristotle believed) or three distinct sources (the brain, heart, and liver, as Galen argued). He also forcefully challenged Aristotle's views on the male and female roles in sexual generation. These differences fueled a fierce dispute between the followers of Aristotle (the natural philosophers) and the followers of Galen (the physicians) for centuries.

Nowhere in medieval thought was the contest between Galen and Aristotle as dramatic as in the works of Avicenna, where the two great traditions intersected. Avicenna wrote the medieval textbook of Galenic medicine the *Qānūn* (the *Canon*), as well as the central medieval statement of Aristotelian biology (the *Ḥayawān*, the biological section of the *Šefā'*). In both works he confronted the problem of the Aristotelian-Galenic division, and settling the contest between the two titanic authorities became the cardinal interest of his life-work in medicine and biology.

Already in book 1 of the *Canon* (composed before 405/1015, when he was thirty-five years old). Avicenna had taken Aristotle's side in the theoretical controversies, with the ironical result that this most influential Galenic document of the Middle Ages was written by someone openly committed to the Aristotelian point of view. This apparent irony only deepens when we realize that the *Ḥayawān*, arguably Avicenna's most explicitly Aristotelian work, harbored a massive amount of purely Galenic material. In fact, Avicenna's synthesis depended on accepting the new (post-Aristotle) Galenic evidence in anatomy and physiology, and equally on interpreting it so as to fit Aristotelian theory.

The Canon. Galen (and Hippocrates as presented by Galen) had generally dominated Islamic medicine from its beginnings. Galen's positive ideas about anatomy, physiology, disease, and treatment of disease have the pride of place in the *Canon*, as they do in all of Islamic medicine.

The *Canon* has been accurately described as a "monumental unity," and "the clear and ordered 'summa' of all the medical knowledge of Ibn Sīnā's time" (A.-M. Goichon, "Ibn Sīnā," *EI²* III, p. 942). In this, Avicenna did not break new ground. As a magisterial exposition of Galenic medicine the *Canon* is not unique, nor was it the first in Arabic. Islamic medicine had developed for two centuries before Avicenna: Ḥonayn b. Esḥāq (fl. 192-260/808-73) and his associates had firmly established its sources and Arabic terminology, and 'Alī b. Sahl Rabbān Ṭabarī, Moḥammad b. Zakarīyā' Rāzī, and 'Alī b. 'Abbās Majūsī (q.v.) had all published systematic and sophisticated medical works. Majūsī's *Kāmel al-ṣenā'a al-ṭebbīya*, in particular, rivals and *Canon* in size as well as in the clarity and authority of its exposition of Galenic medicine.

The *Canon* is organized into five books. Book 1 (the *Kollīyāt*) covers the basic principles of medicine, and is in four parts. Part 1 discusses the constitution of the body (What is it made of? The four elements: earth, water, air, and fire, and the four humors: blood, phlegm, yellow bile, and black bile, whose mixture determines the temperament of every individual); the anatomy of uniform parts (the bones, muscles, nerves, veins, and arteries); and general physiology (How does the body function?). Part 2 deals with the causes and symptoms of disease. Part 3 is devoted to preventive medicine (*ḥefẓ al-ṣeḥḥa* "the maintenance of health"), principally through disciplined living and diet. Part 4 deals with the treatment of disease, again with emphasis on regimen and diet, and on medicines only when these fail.

Avicenna devoted two of the *Canon*'s five books to medicines: Book 2 comprises the Materia Medica, which lists about 800 individual drugs, mostly of vegetable origin (but with many animal and mineral substances); and book 5 (the Formulary), which contains some 650 compounded prescriptions—theriacs, electuaries, potions, syrups, etc.

The diseases of particular organs, starting from the head and moving down to the toes, are systematically discussed in book 3. Book 4 deals with medical conditions that affect the body as a whole (fevers, poisons) or that could happen to any part of it (wounds, fractures). It concludes with a treatise on personal hygiene, emphasizing care of the hair, skin, nails, body odor, and the treatment of overweight or underweight persons.

Medicine and natural philosophy. No doubt the *Canon*'s dominance of later medicine owed much to Avicenna's general influence. Yet it is possible that the *Canon*'s special perspective on Galenic medicine contributed to its popularity among the learned. This perspective can best be appreciated when contrasted with that of Majūsī's *Kāmel al-ṣenā'a*, its closest rival. Majūsī began his book with a history of medicine from the ancient Greeks to his own day, and justified his work without reference to anything else. In contrast, Avicenna avoided the history of medicine, and instead took

extraordinary pains in the *Canon* itself to circumscribe medicine to what he considered to be its proper domain. By defining the place of medicine in the hierarchy of the sciences, something which Majūsī had failed to do, Avicenna increased the appeal of his work as a textbook for teachers of the medieval curriculum.

Since in practice the content of medicine and natural philosophy overlapped, Avicenna wished to delineate clearly their respective areas of competence. He devoted the first chapter of the *Canon* to this task, and repeatedly returned to it afterwards. Medicine for him was indeed an independent science with its own special subject, as the first sentence of the *Canon* makes clear: "Medicine is a science by which we learn about the conditions of the human body in health and in the absence of health, in order to maintain health or to restore it." However, medicine begins with a set of basic concepts (including the "elements," "humors," temperaments," and "faculties," i.e., the common vocabulary of Galenic medicine) which it borrows from natural philosophy. The actual investigation of these theoretical concepts falls outside the purview of medicine, belonging instead to natural philosophy. According to Avicenna, the physician could not independently answer such questions as: Do the elements exist? What are the humors? How many faculties are there? He persistently admonishes the physician to leave this task to the natural philosopher. When Galen dealt with such questions, Avicenna writes, he did so "not as a physician, but as someone who wanted to be a philosopher" (*Canon* I, pp. 4, 5, 6, 17, 19, 21, 67, 71, 72).

A certain urgent purpose emerges through Avicenna's repeated admonitions, namely his desire to safeguard natural philosophy, and the authority of its master Aristotle, from the inroads of Galenism. But his emphasis on the difference between the two sciences amounted to little more than a holding action. For the real source of the trouble was that medicine and natural philosophy, though distinct, were nevertheless joined together like Siamese twins by anatomy—the common material on which all medical and biological discussion depended. And since anatomical knowledge was supposed to be based strictly on "experience and dissection" (ibid., I, p. 5), there were no grounds for asking the physician to defer to the philosopher in arguments about anatomical facts. It is this which had given Galen's challenge its cutting edge, for he was the beneficiary of centuries of anatomical discoveries after Aristotle.

The essence of the problem for Avicenna was that Aristotle's anatomy was comparatively primitive, and had enfeebled his whole biological system. Ultimately Avicenna was able to deflect Galen's challenge only by rebuilding the Aristotelian system on the firmer basis of the new anatomy. But what he did in the *Canon* was principally to recognize the problem, his normal practice being (1) to say that a controversy exists (on generation or the heart) between Galen (or the physicians) and Aristotle (or the philosophers), and to state briefly the two positions, and (2) to say either that he

will resolve the dispute in his philosophical works (ibid., I, p. 22), or that "serious analysis" will show that Aristotle's view is the correct one (p. 67). It was only in the *Ḥayawān*, much later, that he confronted the problem head on.

The Ḥayawān. The *Ketāb al-ḥayawān* (Book of animals) is the last and largest part of the "Physics" (*Ṭabīʿīāt*) of the *Šefāʾ*. The *Šefāʾ* itself is highly original in conception, being the first all-inclusive work in philosophical literature, giving a detailed exposition of all the Greek, primarily Aristotelian sciences. Avicenna's purpose in the *Šefāʾ* was not to write a commentary on Aristotle, but to restate the Aristotelian arguments convincingly. His method is more clearly evident in the *Ḥayawān* than in any other part of the *Šefāʾ*.

The *Ḥayawān* is organized into nineteen books following the scheme of Aristotle's own "Book of animals." This was a translation of the three treatises, *Historia animalium*, *De partibus animalium*, and *De generatione animalium*. The Arabic translation, traditionally ascribed to Ebn al-Beṭrīq, regarded the three treatises as one corpus, in 19 *maqālas* (books). Books 1-10 represented the *Historia*, books 11-14 the *De partibus*, and books 15-19 the *De generatione*. The *Historia* contained Aristotle's descriptions of some 500 animals and their behavior, mostly raw material that could be augmented without raising any theoretical problems. He took up the difficult problems of the classification of animals and their anatomy in the *De partibus*, and it was here that Galen had seriously encroached on his system. The same situation held for the *De generatione*, the most significant of his biological works. The *Ḥayawān* text treats the Aristotelian biology in three ways: summary, new synthesis, and outright substitution.

a. Summary. Ebn al-Beṭrīq's translation of Aristotle was especially poor. Avicenna's *Ḥayawān* provided a more accessible account of the Aristotelian biology, in the form of clear summaries of (1) the *Historia* (*Ḥayawān*, books 1-8, pp. 1-140, except chapter 2, book 1, pp. 10-19, and chapter 1, book 3, pp. 40-46) and (2) of the *De generatione* (*Ḥayawān*, books 15-19, pp. 384-433). There is little doubt that Avicenna based his summaries on Ebn al-Beṭrīq's translation, to judge from his direct quotations from it (e.g., *Ḥayawān*, p. 398). Three centuries later Ebn Qayyem Ǧawzīya also quoted directly the same translation (*Meftāḥ* II, pp. 155-56) which suggests that it was the only available one (published in the various volumes of Brugman and Drossaart Lulofs, Kruk, and Badawī).

b. New synthesis. In the *Ḥayawān* Avicenna was firmly committed to Aristotle's theoretical conclusions, and equally determined to modernize Aristotelian biology. The new material consisted almost entirely of the later anatomy of the Hellenistic physicians which Galen had inherited and elaborated, and Avicenna had already taught in the *Canon*. Joining the fray openly as the loyal champion of Aristotle, he was able to win for Aristotelian theory a new lease on life, but only by accepting a large portion of Galen's positive contri-

bution, his intemperate attacks on him notwithstanding ("Let us then look at Galen's contradictions, and show that he did and said nothing well, that even when he thought he presented proof, he did not convince; and that he is extremely weak in the principles [of philosophy], even though he is very productive in the branches of medicine." *Hayawān*, pp. 146, 155).

In the first part of the *Hayawān* (pp. 1-140) Avicenna had essentially followed Aristotle's outline by selecting material from the *Historia* on the behavior of animals and adding similar observations of his own. However, there is early in book 1 a significant departure from this method where chapter 2 (pp. 10-19) consists of non-Aristotelian anatomical material lifted verbatim out of the *Canon* (I, book 1, pp. 19-24). This is a harbinger of the major textual transplant that will occur in later sections of the *Hayawān* to be discussed below. Of more immediate interest is chapter 1, book 3 where at last Avicenna deals with the problem of the heart, fulfilling the promise he had made in the *Canon* (e.g., I, p. 22) as well as in *Ketāb al-nafs* (p. 234), the *De anima* of the *Šefā*.

Aristotle believed the heart to be the central location of the soul — the organizing principle of all the functions of the body, including digestion ("concocting" food into blood), sensation, and movement. He made little distinction between the veins and arteries, calling them both by the same term, *phlebes* (blood vessels). Being convinced of the need for a central focus for all sensation, and writing before the discovery of the nervous system, he also assigned that role to the heart. In brief, Aristotelian biology asserted that the heart was the origin, anatomically, of the arteries, veins, and nerves.

The Hellenistic physicians after Aristotle made major advances in anatomy. Praxagoras of Cos (fl. ca. 300 B.C.) distinguished clearly between the arteries and the veins; Herophilus of Chalcedon (fl. ca. 300 B.C.) discovered the nervous system; and Erasistratus (fl. 258 B.C.) gave the blood-making faculty to the liver, not the heart. By Galen's time, scientific opinion saw the brain as the origin of the nerves (and the faculty of sensation), the liver as the origin of the veins (and the faculty of digestion), and the heart as the origin of the arteries only. Galen summed up the arguments forcefully in his *De placitis Hippocratis et Platonis*.

Avicenna, in a typical example of his general method in the *Hayawān*, managed to accept the new anatomy and, at the same time, hold firmly to the Aristotelian theory that the heart is the origin of all the body's faculties. He argued that Galen's anatomical facts, where indeed the nerves appear to "grow" from the brain and spinal cord, and the veins from the liver, derived from dissection of the completely formed animal. Avicenna interpreted Aristotle to mean that the heart is the origin of all the organs and their faculties in embryological development, where it is the first organ to be formed by the soul, and all else is formed later through its agency (*Hayawān*, pp. 40-46).

The shift of the argument to embryological develop-

ment was not entirely tactical on Avicenna's part, for in fact it pointed to his and Aristotle's primary concern in biology, namely the problem of sexual generation and development of the fetus. Aristotle had set about to answer such questions as: What is it that tells the fetus to develop into dog, or human, or horse? How does the fetus know how to develop the organs? How does it know the order of their development and differentiation? In brief, what is the organizing principle? Aristotle found the answer in the soul, whose connection to the heart and to the male semen is the backbone of the Aristotelian-Avicennan biology.

In book 9, while still in the part ostensibly devoted to the *Historia*, Avicenna abruptly departed from Aristotle's model to discuss, with some urgency, "the controversies about semen and the fetus — not according to Aristotle's scheme, but following what we consider more appropriate in our own time (pp. 144-45)." The discussion of sexual generation which followed became the pivotal discussion of the *Hayawān* and determined Avicenna's method in the biology as a whole.

The normal location of this discussion would have been in books 15-19 of the *Hayawān* (where Avicenna made a masterly abridgment of the *De generatione*, repeating briefly some of the arguments of book 9). Clearly Galen's challenge had forced him to confront the issue early on. The titles of the first three chapters of book 9 give a palpable sense of a drama to this central section of the *Hayawān*: (1) "On puberty, semen, menses, and the controversy about them." (2) "On Galen's criticism of Aristotle, and the refutation of that criticism, and the establishment of its fatuousness." (3) "The return to the Aristotelian source, and the proof that women do not really have semen, and that the female matter called semen has no formative faculty, but only a passive faculty ..."

The Greek thinkers had disagreed radically on the question of parental contribution to sexual reproduction. Hippocrates maintained that both male and female contribute "semen," reasoning that the child's resemblance to both of its parents means that both contribute similar reproductive material to it (*Hippocratic Writings*, p. 322). Aristotle categorically rejected this theory, and formulated a radical distinction between the male and female contributions, asserting that the female provides only the passive material (menstrual blood) which the male semen, as sole carrier of the soul, forms into the fetus. He maintained that semen was a residue of the blood, which only the male, by virtue of his adequate vital heat, could transform into semen. The female, lacking this ability because she is not "hot" enough, discharges her contribution as menstrual blood (*De generatione*, 728a, 726b, 730b, 738b).

Galen re-affirmed the original Hippocratic idea of equal contribution, and supported it with new evidence. Although he agreed with Aristotle that semen was a residue of the blood, he insisted that women as well as men could produce it. According to him, both male and female semina contributed equally to the "form" as

well as to the "matter" of the fetus. His new evidence was the discovery (probably first made by Herophilus of Chalcedon) of the ovaries which he called "female testicles." Aristotle had had no notion of these organs and had also denied that the male testicles contributed to the actual production of semen. Galen re-affirmed the direct relevance of the testicles to reproduction and was able to point to their existence in both sexes (*De semine* 1.5 (ed. Kuhn, vol. IV), pp. 527ff.).

By Avicenna's time the discovery of the ovaries had long been incorporated into the body of scientific knowledge. His first statement of the problem made clear the degree to which Aristotelians were on the defensive, and the extent to which Galenism had come to define the basic issues of generation (*Hayawān*, pp. 145-46). In what was a critical departure in Aristotelian biology, Avicenna's response was to accept the existence of the ovaries and the argument that it is the female semen, and not menstrual blood, which represents the basic female contribution to reproduction (ibid., pp. 145, 161, 388-90). But in what sense, then, can we still speak of Avicenna's biology as Aristotelian? What remained of the original Aristotle? Nearly everything that mattered. Avicenna applied to the female semen Aristotle's central hypothesis, giving it exactly the same role that Aristotle had assigned to the menstrual blood: "Clearly the seed of women is fit to be matter, but not fit to be the principle of movement. The seed of men is the principle of movement" (ibid., p. 399).

There were purists among the Aristotelians after Avicenna, for example Ebn Rošd, who held fast to the letter of Aristotle ("As to the 'testicles' which Galen claims women have, it is possible that they play no role in generation—if the 'semen' they produce has no role in generation. This is not strange when you consider that breasts in the female are organs of generation, but do not have such a function in the male. ... If the female semen could do what the male can, a female should be able to generate by herself, and there would be no need for the male." Ebn Rošd, *Kollīyāt*, p. 30). However, most medieval Aristotelians, East and West, attest to the success of Avicenna's solution, for they elected to view their biology through him (Sarton, *Introduction* II, 1, p. 63), even though the original Aristotle was available to them in both Arabic and Latin. Avicenna's version was much less vulnerable to Galenic attack than the original.

c. Substitution. Fitting the ovaries into Aristotle's anatomy was the cardinal example of Avicenna's treatment, but—as we have already noted—the first anatomical discussion in the *Hayawān* came directly from the *Canon*. Similarly, the chapter on the development of the embryo (book 9, chap. 5, pp. 172-78), and the anatomy of the penis and the uterus (book 15, chap. 1, pp. 387, 388-89, 390) were also taken verbatim from the *Canon*.

The attempt to update Aristotle's data is especially blatant in books 11-14 of the *Hayawān*, the sections which parallel Aristotle's *De partibus animalium* (pp. 188-383). Here there took place a wholesale substi-

tution: Most of the original Aristotelian text was simply discarded and replaced by Galenic material lifted out in bulk from the *Canon*. The substituted text included all the anatomy of uniform parts from book 1 of the *Canon* (I, pp. 6-66) and nine sections on the anatomy of the organs from book 3 (II, pp. 2-5, 108-110, 208-10, 261-62, 283-86, 349-50, 418-21, 555-56, and 557-62).

Over seventy-five percent of the text of books 11-14 (150/195 pages) and fully forty percent of the text of the whole *Hayawān* (170/433 pages) came from the *Canon*. The transplanted material—aside from its critical implications for the establishment of Avicenna's texts—radically changed the original balance of Aristotle's biology. In Bekker's edition of the greek text of the three treatises, the *De partibus* occupies only twenty-one percent of the pages; in the Cairo edition of the *Hayawān*, books 11-14 (representing the *De partibus*) fill forty-five percent of the pages. In the process of updating Aristotle, the space devoted to anatomy was more than doubled.

The *Hayawān* changed the emphasis of Aristotle's biology in another important way. Aristotle, although emphasizing man, considered the whole animal kingdom as his subject. The anatomy transplanted from the *Canon* was exclusively human anatomy, tending to narrow the focus of biology from the living creation as a whole to man. This was the clearest effect on natural philosophy of Avicenna the physician.

d. Composition of the *Hayawān*. The substitution of the new anatomy for the old carried out—with vengeance—Avicenna's evident design to modernize Aristotle. Yet the size and extraordinary crudeness of this textual transplant are startling, and raise a question about the extent of Avicenna's direct responsibility for it.

The text of the *Hayawān* is uneven. Books 1-10 and 15-19 (representing the *Historia* and the *De generatione*) are clearly more finished than books 11-14. Their borrowings from the *Canon* are limited (a total of twenty pages) and well integrated either into genuine summaries of Aristotle (books 1-8 and 15-19), or into a new synthesis (books 9-10). In contrast, the transplanted text of books 12-14 (book 11 poses a special problem to be discussed below) was merely adjusted to the *Hayawān*'s different arrangement of subjects, as Table 31 shows.

There is a revealing record of the checkered fortunes of the *Šefā'* in general and the *Hayawān* in particular. According to Abū 'Obayd Jūzjānī, Avicenna's companion and biographer, the *Šefā'* took seventeen years to write, with many interruptions, and with the *Hayawān* always left to the end. Avicenna worked on the *Šefā'* during three separate periods. The first was in 406/1015: "I asked him to comment on the works of Aristotle... and so he began with the "Physics" of a work he called the *Šefā'*." However, he made little progress and dropped the project for six years. The second period was in 412/1021, when he "finished all of the 'Physics' and 'Metaphysics', with the exception of the book on Animals." Lastly, during his years in Isfahan after

Table 3

CONCORDANCE BETWEEN THE TEXTS OF THE *HAYAWĀN* AND THE *QĀNŪN*

Hayawān	*Qānūn*
Book 1:	
1. General anatomy, pp. 10-19.	I, pp. 19-24.
Book 9:	
2. Development of the embryo, pp. 172-78.	II, pp. 557-62.
Book 12:	
3. The temperaments, pp. 192-204.	I, pp. 6-13.
4. The humors, pp. 205-18.	I, pp. 17-19, 13-17.
5. The brain, pp. 226-33.	II, pp. 2-5.
6. The nerves and spinal cord, pp. 235-46.	I, pp. 53-59.
7. The bones, pp. 248-49, 251-54.	I, pp. 24-26.
8. The eyes and their muscles, pp. 255-60.	II, pp. 108-10.
9. Movements and muscles of the head, pp. 266-69.	I, pp. 42-43, 40, 41.
Book 13:	
10. The teeth, pp. 270-71.	I, p. 28.
11. The organs of breathing, pp. 277-82.	II, pp. 208-09; I, p. 44; II, pp. 209-10.
12. The heart and its arteries, pp. 283-91.	II, p. 261; I, pp. 59-61; II, pp. 261-62.
13. The organs of digestion, pp. 292-96.	II, pp. 283-86.
14. The intestines, pp. 300-07.	II, pp. 418-21; I, p. 50; II, p. 421.
15. The liver and veins, pp. 308-19.	II, pp. 349-50; I, pp. 62-66.
Book 14:	
16. The collarbone, shoulder, arms, pp. 330-37.	I, pp. 33-37.
17. The spine and neck, pp. 338-41.	I, pp. 28-30.
18. The backbone and the chest-cargo, pp. 342-47.	I, pp. 30-32.
19. The ribs, pp. 348-50.	I, pp. 33, 37.
20. Their muscles, pp. 351-59.	I, pp. 49, 45-49.
21. The leg, pp. 360-69.	I, pp. 37-39, 51-53.
22. The jaw, pp. 376-77.	I, pp. 26-27.
23. The check and lips, pp. 378-81.	I, pp. 41-42.
Book 15:	
24. The penis and the uterus, pp. 387, 388-89, 360.	I, p. 50; II, pp. 555-56.

415/1024, "he finished the *Šefā'*, except for the two books on the Plants and the Animals, which he wrote on the way in the year that 'Alā'-al-dawla attacked Sābūr Kᵛāst (most probably 423/1032). He also wrote the *Najāt* en route." (Gohlman, *Life*, pp. 54-67).

Was it true that Avicenna wrote the *Najāt* and the *Hayawān* together on the same trip? Curiously the *Najāt*, which he composed by simply selecting material from all parts of the *Šefā'*, has preserved no memory of the *Hayawān*. It would be easier to understand why the *Najāt* omitted the biology if we were to assume that when he composed it, Avicenna was not working on the *Hayawān* and considered it unfinished.

Did Avicenna ever finish the *Hayawān*? Here the case of book 11 is the most telling. It exists, if this is the right word, as one paragraph of less than six lines. The nature of this paragraph is not entirely a mystery. In 1021, the

second time he began working on the *Šefā'*, Avicenna first produced an outline of "the main topics" of the whole work. (When Jūzjānī later said, in his introduction to the *Šefā'*, that Avicenna finished the book when he was forty years old—Avicenna was born in 370/980—he could have only been referring to this completed outline.) As it now stands, book 11 represents literally the "main topic" from Avicenna's original outline of 412/1021, and nothing more. The subject of book 11 is of critical importance. In the original *De partibus* it contained Aristotle's theoretical justification for his system of classification and anatomy, and it attracted lengthy commentaries by Ebn Bajja (Avempace) and Ebn Rošd. It is tempting to suggest that when Avicenna and Jūzjānī took the road to Sābūr Kᵛāst in 1032, books 11 to 14 of the *Hayawān* were still unwritten. Ultimately, books 12, 13, and 14 were

"finished" by raiding the *Canon*. But there was no such convenient source for book 11 of the *Ḥayawān*, since Avicenna had not dealt with the subject anywhere else in his writings. Neither Avicenna on the road, nor Jūzjānī after him, ever finished it.

Bibliography: References to Avicenna's works are to the Cairo editions: (1) *Ketāb al-qānūn fi'l-ṭebb*, 3 vols., Būlāq and Cairo, 1877. The *Qānūn* has not been critically edited, and there are differences between the Cairo-Būlāq edition and the Rome edition of 1593. Book 1 is available in English, based on the twelfth-century Latin translation of Gerard of Cremona (with its own departures from the Arabic text) in O. C. Gruner, *A Treatise on the Canon of Medicine, Incorporating a Translation of the First Book*, London, 1930. Gruner omits the anatomy, which is included in M. A. Shah's more recent translation of book 1, *The General Principles of Avicenna's Canon of Medicine*, Karachi, 1966. (2) *Al-Ḥayawān*, section 8 of the *Ṭabīʿīyāt* of the *Šefāʾ*, ed. Montaṣer, Zāyed, and Esmāʿīl, Cairo, 1970. This is easier to read than the Tehran lithograph of 1886 (the *Šefāʾ*, including the *Ḥayawān*, pp. 507ff.), but does not otherwise improve on it, principally because the editors are unaware of the relationship of their text to that of the *Qānūn*. (3) *Ketāb al-nafs*, section 6 of the *Ṭabīʿīyāt* of the *Šefāʾ*, ed. G. C. Anawati and S. Zāyed (Cairo, 1974).

References to the works of Aristotle are to the Loeb Classical Library editions, edited and translated by A. L. Peck, *Historia animalium* (Cambridge and London, 1965-), *Parts of Animals* (Cambridge and London, 1968), and *Generation of Animals* (Cambridge and London, 1942). The Greek text was established by August Immanuel Bekker in the Berlin edition of Aristotle (Berlin, 1831), vol. 1: *Historia*, pp. 486-638, *De partibus*, pp. 639-97, *De generatione*, pp. 715-89. The Arabic translation ascribed to Ebn al-Beṭrīq: *Ṭebāʿ al-ḥayawān* (*Historia*), ed. ʿA. Badawī, Kuwait, 1977; idem., *Ajzāʾ al-ḥayawān* (*De partibus*), Kuwait, 1977, and separately by R. Kruk, Amsterdam, 1978; *Fī kawn al-ḥayawān* (*De generatione*) ed. J. Brugman and H. J. Drossaart Lulofs, Leiden, 1971. Ebn Qayyem Jawzīya quotes from this translation in his *Meftāḥ dār al-saʿāda*, 2 vols., Beirut, repr. of the Cairo edition, n.d. Ebn Rošd defends the original Aristotelian position on sexual generation in his *al-Kollīyāt*, ed. A. Bustani, Spanish Morocco, 1939.

The most important Hippocratic writings for Islamic medicine and biology are *The Seed and The Nature of the Child*, translated by I. M. Lonie in G. E. R. Lloyd, ed., *Hippocratic Writings*, London, 1978. The medieval Arabic translation has been edited by M. C. Lyons and J. N. Mattock, *Ketāb al-ajenna le-Boqrāṭ*, Arabic Technical and Scientific Texts 7, Cambridge, 1978. Galen's *De semine* is in C.G. Kuhn, ed., *Claudii Galeni opera omnia*, 20 vols., Leipzig, 1822, vol. IV, pp. 512-651; his *De placitis Hippocratis et Platonis* has been edited and

translated by P. H. De Lacy, *Galen: On the Doctrines of Hippocrates and Plato*, 3 parts, Corpus Medicorum Graecorum, vols. 4, 1, 2, Berlin 1980-84.

ʿAlī b. ʿAbbās Majūsī's *Kāmel al-ṣenāʿa al-ṭebbīya*, 2 vols. Būlāq and Cairo, 1294/1877, was studied by M. Ullmann, e.g., *Islamic Medicine*, Edinburgh, 1978. Avicenna's autobiography, covering his career until the age of 30, and Jūzjānī's biography which covers the rest of his career have been edited and translated by W. E. Gohlman, *The Life of Ibn Sina*, Albany, 1974. The significance of Avicenna's biology for medieval Europe is succinctly stated by G. Sarton, *Introduction to the History of Science*, 5 vols., Baltimore, 1927-48, II, I, p. 63. Islamic medicine after Avicenna is surveyed, with bibliography, in S. H. Nasr, *Islamic Science*, London, 1976, chap. 8. The relation of Avicenna's *Ḥayawān* to Islamic religious thought and to later Islamic natural philosophy is discussed in B. F. Musallam, *Sex and Society in Islam*, Cambridge, 1983, chap. 3, with notes and bibliography.

(B. MUSALLAM)

xi. PERSIAN WORKS.

Only two works in the Persian language by Avicenna have come down to us: a short book entitled *Andar dāneš-e rag* (On the science of the pulse, also known as *Resāla-ye nabż*), and a treatise on philosophy in the broadest sense entitled *Dāneš-nāma* (Book of science).

Authenticity. No problem of authenticity exists in the case of either work. Avicenna's authorship was confirmed by his disciple and friend Abū ʿObayd ʿAbd-al-Wāḥed b. Moḥammad Jūzjānī (Gowzgānī) and has never been called in question (Ebn al-Qefṭī, *Taʾrīḵ al-ḥokamāʾ*, p. 418; Ebn Abī Oṣaybeʿa, *ʿOyūn* II, p. 2; Ẓahīr-al-dīn Bayhaqī, *Taʾrīḵ*, pp. 59-60). The prefaces of the two works show that both were written at the request of ʿAlāʾ-al-dawla Kākūya, the Buyid ruler of Isfahan, i.e., during the last fourteen years of Avicenna's life, which he spent in that city. Comparison of these prefaces, both addressed in eulogistic language to the ruler of Isfahan, indicates that *Dāneš-e rag* was probably composed before the *Dāneš-nāma* because Avicenna states in the preface to the latter that "in that prince's shadow he had achieved all his ambitions—for security, dignity, respect for science..." This implies that he had spent many happy years at Isfahan before he completed the *Dāneš-nāma*.

General description. Avicenna's writings in Arabic, the language of religion and scientific expression in the entire Muslim world at that time, were intended for his disciples and other specialists and may be described as "advanced textbooks." In marked contrast, his two books in Persian, the spoken and literary language of the Iranian peoples, are introductory manuals written for the use of an uninitiated person and possessing the appropriate qualities: Clear language, near-colloquial phraseology (Arabic technical terms being replaced with Persian equivalents in the *Dāneš-nāma* and given

together with Persian equivalents in *Dāneš-e rag*), choice of themes and questions which give access to relatively elementary knowledge in each field, exclusion of subjects which could only be of interest to specialists, reduction of chapter lengths, and frequent use of explanatory description rather than logical definition. These are among the common characteristics of the two works. The contents of each are outlined below.

Andar dāneš-e rag (ed. S. M. Meškāt, *Rag-šenāsī yā resāla andar nabż*, Tehran, 1330 Š. /1952, with a list of technical terms). The book's first three chapters are a prologue to its main subject, study of the pulse. They describe (1) the substances which, when in harmonious synthesis, constitute the human body, the vital spirits which animate it, and the soul (*ravān, nafs*) which dwells in it; (2) the necessity of inhalation, nutrition, and elimination; (3) the functions of the lungs, heart, and arteries as regulators of the pulse, illustrated by the example of the blacksmith's bellows, and the way in which, at every beat, these regulators cause movements of expansion and contraction, each followed by a pause.

The study of the pulse as such is commenced in chapter four and pursued in chapters five and six. Here the author gives simplified summaries of the thorny problems which he had examined in detail in the first chapter of the eleventh section (*fann*) of the first volume of the *Qānūn fi'l-ṭebb*, namely, (1) why every beat comprises the aforesaid four moments; (2) a list of ten types of pulse condition with descriptions of symptoms which permit diagnosis of each; (3) explanation of the causes of these ten types and of varieties and sub-varieties to be found in each, together with the appropriate Persian and Arabic technical terms, such as long (*derāz*) pulse and short (*kūtāh*) pulse in conditions identifiable by the length (*andāza*) of the beat, rapid (*tīz*) and slow (*derangī*) in conditions identifiable by its frequency, even (*hamvār*) and uneven in conditions identifiable by the symmetry or dissymmetry (*mostawī-mānanda būdan wa nabūdan*) of the beats. Chapter seven is a summary of the discussion of regular and irregular (*mostawī wa moktalef*) pulse behavior in the second chapter of the above-mentioned third lesson in the *Qānūn*, and chapter eight, which enumerates varieties and name of composite pulse conditions, is a summary of the third chapter of the same lesson. Some of the descriptive terms for pulse conditions used in this book correspond to those used in modern medical textbooks, e.g., *mūrčagī* (Ar. *al-namlī*, formicant), *setabr ʿaẓīm* (large), *dom-e mūšī* (myurous), *mawjī* (bounding, undulating) *do-zakmī* (dicrotic).

Chapter nine, which concludes the work, is a summary of all the questions studied in the remaining sixteen chapters of the lesson in the *Qānūn*, namely, the best pulse condition, the constituents of the pulse, the factors which influence these constituents, the pulse in males, females, and pregnant females, the pulse in different ages, life-stages, seasons, temperatures, and temperaments, and the effects of climates, sleep, being awake, bathing, physical exercise, pain, inflammations, and emotions on the pulse.

This short book's plan of three introductory chapters, three chapters on the more difficult problems, and one final chapter dealing concisely with easier matters shows that Avicenna intended it to be a condensed synopsis. He accomplished his task with great skill.

Dāneš-nāma. This work, like the *Šefāʾ* and the *Najāt* (but unlike the *Ketāb al-ešārāt* which deals only with logic and metaphysics) is a comprehensive treatise on seven sciences grouped in four sections: logic (ed. S. M. Meškāt and M. Moʿīn, *Manṭeq-e Dāneš-nāma-ye ʿalāʾī*, Tehran, 1331 Š./1952), metaphysics (ed. M. Moʿīn, *Elāhīyāt-e Dāneš-nāma-ye ʿalāʾī*, Tehran, 1331 Š./1952), natural science (ed. S. M. Meškāt, *Ṭabīʿīyāt-e Dāneš-nāma-ye ʿalāʾī*, Tehran, 1331 Š./1952) and mathematics (the last-named consisting of geometry, astronomy, arithmetic, and music). The original section on mathematics was lost in Avicenna's lifetime, and the extant text (ed. M. Mīnovī, *Rīāżīyāt-e Dāneš-nāma-ye ʿalāʾī*, Tehran, 1331 Š./1952) is a reconstituted version which his disciple ʿAbd-al-Wāḥed Jūzjānī put together by translating into Persian the master's short monographs on the same subjects. (The original Arabic monographs constitute the mathematical section of the *Ketāb al-najāt*, which was not edited by Avicenna himself).

The *Dāneš-nāma* should not be compared with the *Šefāʾ*, an encyclopedic work in which the number and diversity of the problems and theories under discussion is very great and the number of the chapters is very large. Although comparable to the *Najāt* in general content, the *Dāneš-nāma* differs from it in the relative lengths and specific topics of the chapters and the order of the sections. Its exposition of logic, in two parts on definition and proof respectively, follows the plan of the *Ešārāt* rather than that of the *Najāt*. Although most of its chapters are summaries or abridgments of chapters in the *Najāt*, there are some which give longer and fuller explanations. The abridgment is generally done through combination of two or more chapters into a single chapter with a composite title, e.g., the chapter on "Explanation of genus, species, difference, common property, and accident" (*Bāz namūdan-e jens, nawʿ, faṣl, kāṣṣa wa aʿrāż-e ʿāmm*). In some cases, however, the abridgment is done through suppression of chapters interesting only to academicians and specialists, e.g., that on the theory of the contents of propositions and the three modalities of judgment (possible [*šāyad būdan, momken*], necessary [*żarūrī*], and impossible [*na-šāyad būdan, momtaneʿ*]). This theory, which is one of the bases of Avicenna's logic of judgment, receives only ten lines of explanation in the *Dāneš-nāma* compared with ten pages in the *Najāt* and twelve pages in the *Ešārāt*. Also drastically pruned is the treatment of contradiction and conversion, which are here reduced to their absolute forms; Avicenna preferred to omit from the *Dāneš-nāma* any discussion of contradiction and conversion in modal propositions. The discussion of the four figures of the syllogism is equally brief. On the other hand, Avicenna writes at considerable length in this book on a

subject passed over in silence in the *Ešārāt*, namely reasoning by analogy (*metāl*); he here denounces this method of reasoning dear to the scholastic theologians whom he describes as "dialecticians" (*jadalīān*). He also writes at some length on the "subject-matter of the syllogism," one of his main innovations which forms the epistemological aspect of his logic and is its most strikingly original contribution, being concerned with search for the sources of human knowledge and evaluation of its degrees of certainty.

As regards metaphysics, a noteworthy feature of the *Dāneš-nāma* is the placing of this subject immediately after logic, whereas in both the *Najāt* and the *Šefāʾ* the metaphysical discussions form the concluding and crowning section of the work. The different arrangement in the *Dāneš-nāma* is not fortuitous. This book was written in order to acquaint an uninitiated mind with the notion of science and its subject and object, and with the division of the sciences into speculative and practical disciplines and the subjects and objects of each. For this purpose there was need of an introductory prologue which could only be placed straight after the section on logic and at the head of the section on metaphysics. The generalized outline of the subjects and objects of the sciences leads on to define explanations of the subject of higher science (*ʿelm-e barīn*), i.e., metaphysics, namely, being qua being, and of its object, namely, the states of being qua being. These states are presented as pairs of opposites. They provide the chapter headings and the content of the metaphysical section of the work as follows: substance (*jawhar*) and accident (*ʿaraż*), universal (*kollī*) and particular (*jozʾī*), single (*wāḥed*) and multiple (*kaṯīr*), cause (*ʿellat*) and effect (*maʿlūl*), action (*feʿl*) and potentiality (*qowwa*), possible (*momken*) and necessary (*wājeb*); these are predicates of being qua being.

By starting with the study of substance and accident as the first pair of states of being qua being, Avicenna breaks more frankly here than in the *Šefāʾ* with the Aristotelian conceptions and traditions regarding the theory of substance and its categories of accidents and the position of these ten highest genera of "things." In the *Dāneš-nāma* he integrates this study with metaphysics, while in the *Najāt* he examines the categories together with the theory of definition in the section on logic. Now this idea of substance and its nine categories conceived as the ten highest genera of "things" is directly linked to another idea which is fundamental to Avicenna's metaphysics, i.e., the idea of the accidentality of existence; for saying that such and such a substance or accident exists is tantamount to saying that existence is not the element which constitutes the essence (quiddity) of any of these ten highest genera of "things," in other words that existence is not logically conceivable as other than an accidental predicate of the essence. The presentation of this original theory is all the more noteworthy because Avicenna begins his discourse with a criticism of "persons who lack sharp insight," i.e., scholastic theologians, in the *Najāt* called *motakallemān*. At the same time this idea of existence as

an accidental predicate of the essence is closely connected with the last pair of states of being qua being, namely the contingent and the necessary.

The study of these two states forms the introduction to the second area of metaphysics, which Avicenna calls "the science of divine sovereignty." Forty chapters are devoted to the search for the Necessarily Existent Being (*Wājeb al-wojūd*) and His attributes (*ṣefāt*. These chapters occupy more than two thirds of the metaphysical section of the *Dāneš-nāma* and form the longest dissertation in the whole book. The relative extent of the section is a measure of the importance which Avicenna attached to it and the more remarkable because the book does not contain any lengthy chapters (such as are found in the *Šefāʾ* and the *Najāt*) on purely theological matters like human bodily resurrection, divine inspiration, proofs of prophethood, etc. This makes the treatment of metaphysics more akin to that in the *Ešārāt* than that in the *Najāt*. Moreover, the *Dāneš-nāma* sometimes echoes the former's directives (*ešārāt*), notably those of chapter six on the purposes of principles and order and chapter seven on detachment (*tajrīd*).

The most distinctive feature of the *Dāneš-nāma*, however, is its style, which is much simpler, easier, less formal, and more lively than that of the Arabic works. In this book Avicenna again takes issue with his adversaries, the scholastic theologians. In the *Najāt* he describes some of them as "weak" (*żoʿafāʾ al-motakallemīn*) (*Najāt*, p. 213), but here he goes further and speaks disparagingly of them as "dialecticians" (*jadalīān*). He ironically ridicules their method of proving the existence of the invisible (*ḡāyeb*), from the existence of the witness (*šāhed*), and in a pretended exposition of their reasoning, ascribes to them actions which expose the logical absurdity of their words, for example in the section on logic (*manṭeq*): "Then they went and gazed at the sky and found that it resembled a house ... " (pp. 96 ff.). Many more words and phrases carry, in the context, an ironic sting, e.g., "they thought of a subterfuge," "some who were a little wilier" (ibid., p. 98). In the section on metaphysics, the criticism is directed at Plato and the Platonic "ideas." In the *Najāt* Avicenna alludes discreetly and very briefly to the Platonic "ideas." In the *Šefāʾ* he devotes a rather long and very closely and forcefully reasoned chapter to their refutation. In the *Dāneš-nāma* he does not refute them but ridicules them. He invites us to imagine the idea of an "idea," that of a unique and real "humanness" (*mardomī*) which would exist per se (*be-ʿaynehī*) in every human individual and would be Plato after acquiring knowledge and someone else if remaining ignorant. Even more astonishing would be the idea of "animal," at once mobile and immobile, flying and flightless, quadruped and biped.

In conclusion, it must be emphasized that the *Dāneš-nāma* is an original work and that its originality does not lie solely in its being written in Persian. After the *Ešārāt*, which Avicenna composed in the same period of his career, it is the most personal of his writings. His

intention to give this book a different stamp from his other works is revealed by his preference for certain themes and the number and length of the chapters which he devoted to them, notably to contingent and necessary, cause and effect, and the Necessary Being and His attributes. Another feature is that he does not include under metaphysics any discussion of extra-philosophical theses such as life after death, missions and miracles of prophets, and marvels of saints, but only touches very briefly on these matters in the section on natural science. His great veneration for Aristotle, "the chief of the sages" (*emām-e ḥakīmān*), "the guide and master of the philosophers" (*dastūr o āmūzgār-e filsūfān*) (*Elāhīyāt*, p. 110; *Ṭabī'īyāt*, pp. 59 and 90), his spontaneous humor, and his genial irony with regard to the scholastic theologians (*motakallemān* or *jadalīān*) give us clues to understanding of the man. This book was, of course, written for a patron who must be spared the bother of reading pedantic disquisitions. Even so, and despite all the abridgments and suppressions, nothing of real importance is omitted. It is a comprehensive treatise on philosophy, unique in its kind among Persian writings in this field.

Editions of the Dāneš-nāma-ye 'alā'ī. 1. Lithographed, under the title *Māya-ye Dāneš-e 'alā'ī mašhūr be'l-Ḥekmat al-'alā'īya*, Hyderabad (Deccan), 1309/1891, comprising three parts—logic, metaphysics, and natural science. Marred by too many errors, but noteworthy as the first published edition. 2. Edited by A. Korāsānī under the title *Dāneš-nāma-ye 'alā'ī yā ḥekmat-e Bū 'Alī*, Tehran, 1315 Š./1926. Critical text based on four mss., comprising two parts—logic (*manṭeq*) and metaphysics (*'elm-e barīn*)—preceded by a preface made up of (1) Korāsānī's translations of the autobiography of Avicenna and the supplementary biography of him by Abū 'Obayd b. 'Abd-al-Wāḥed Jūzjānī (Gawzgānī), (2) some poems attributed to Avicenna, namely, two short pieces in Arabic and four quatrains and a short piece about wine in Persian, (3) a list of Avicenna's works, and (4) a brief study of features of the language of the *Dāneš-nāma* and a glossary of the Persian technical terms in the *Dāneš-nāma* with their Arabic equivalents. 3. Edited by M. Mo'īn and S. M. Meškāt, published for the Avicenna Millenary celebration at Tehran in 1331 Š./1952; consists of the first three parts in separate volumes, namely, (1) logic (*Resāla-ye manṭeq*), ed. Mo'īn and Meškāt, (2) metaphysics (*Elāhīyāt-e Dāneš-nāma-ye 'alā'ī*), ed. Meškāt, (3) natural science (*Ṭabī'īyāt-e Dāneš-nāma-ye 'alā'ī*), ed. Meškāt. The critical text based on ten mss. on the whole concurs with that of Korāsānī despite numerous variants. Appended to each volume is a combined list of Persian and Arabic technical terms in alphabetic order.

The language aspects of the *Dāneš-nāma* and of *Andar dāneš-e rag*, above all the originality of their Persian vocabulary, were noted by Korāsānī and are of great interest to Iranian philologists. This subject was discussed in two communications to the Avicenna Millenary conference at Tehran, one by Ḥ. Katībī on Avicenna's Persian prose style in the context of the

Persian prose of the late 4th/10th and early 5th/11th centuries, the other by M. Mo'īn on Avicenna's Persian vocabulary and its influence on Persian literature (see D. Ṣafā ed., *Jašn-nāma-ye Ebn Sīnā* II, Tehran, 1334 Š./1955, pp. 316-28, 342-90). Holding that the Persian language at the time when Avicenna wrote was more influenced by Pahlavi than by Arabic, Ḥ. Katībī credited Avicenna with the invention of Persian scientific-philosophic terminology and diction; he cites as examples of the distinctiveness of Avicenna's prose style the frequent use of the particles *mar* and *andar*, of the verbal prefix *hamī* instead of *mī*, and the word order of the often terse, but always precise, sentences. M. Mo'īn studied Avicenna's creation of a Persian scientific-philosophic vocabulary, his sources and methods, and the varieties of this vocabulary used by his disciples in their translation of his works and later by other thinkers such as Nāṣer (-e) Kosrow, Afżal-dīn (Bābā Afżal) Kāšānī, and Abū Ḥāmed Moḥammad Gazālī.

Translations of the Dāneš-nāma-ye 'alā'ī. 1. Arabic. The *Maqāṣed al-falāsefa* of Moḥammad Gazālī (d. 505/1111) may be regarded as the Arabic translation of the *Dāneš-nāma* because its structure and content are in general on the same lines. 2. French. Translation of all four parts by M. Achena and H. Massé, under the title *Le livre de science*, 2 vols., Paris, 1955-58; vol. I logic and metaphysics, vol. II natural science and mathematics. Appended to vol. I is an analysis of the metaphysics by Achena. A revised and corrected new edition came out in 1985; to this has been added a prolog comprising translations of Avicenna's autobiography and Jūzjānī's biography, an introduction to the logic, and a revised and amplified version of the same analysis of the metaphysics as in the first edition. 3. English. Translation with commentary by P. Morewedge, entitled *The Metaphysica of Avicenna (Ibn Sīnā): A Critical Translation-Commentary and Analysis of the Fundamental Arguments in Avicenna's Metaphysica in the Dānish Nāma-i 'Alā'ī*, PHS, London, 1973. [The present writer has not seen this book.] 4. Russian. Translation by Bugutdinov, Stalinabad (Dushanbe), 1973.

Avicenna's Persian poems. Avicenna is the reputed author of Persian quatrains and *qeṭ'as* (short poems) quoted in anthologies and miscellanies. Their number and quality vary with the source. There is every reason to believe that Avicenna possessed poetic talent and wrote poems in his spare time, particularly when in captivity. This is attested by the undoubtedly authentic opening verses which are all that remain of two Arabic odes (*qaṣīdas*) which he composed (see *Le livre de science*, Prolog, p. 11). That he should have written poems in Persian, his native and everyday language, is probable, but can not be proved. H. Ethé collected twelve quatrains and two *qeṭ'as* which are ascribed to Avicenna in anthologies and other sources, and published the texts with German translations (*Nachrichten von der Kgl. Gesellschaft der Wissenschaften und der Georg-August-Universität zu Göttingen*, no. 21, 1 September 1875, pp. 555-67). E. G. Browne gives trans-

lations of two quatrains from Ethé's collection (*Lit. Hist. Persia* II, pp. 108-109, 267). S. Nafīsī included in his book on Avicenna's life and works (*Pūr-e Sīnā*, Tehran, 1333 Š./1954) all poems known to have been ascribed to Avicenna, with particulars of the source of each. It may be added that the Bibliothèque Nationale in Paris possesses the following two manuscripts: (1) ms. Suppl. Pers. 793, a small anthology which, on folio 103, contains the quatrain "*Mā-īm be-lotf-e to tamannā karda*" found in many anthologies and attributed in some to Avicenna, in others to Ḵayyām, and following it a quatrain attributed to Abū Saʿīd b. Abiʾl-Ḵayr (cf. Nafīsī, op. cit., p. 47); (2) ms. Suppl. Pers. 1777, a selection of poems by three poets, Qāsem al-Anwār, ʿAṭṭār, and Nāṣer Ḵosrow, in which have been inserted, on the margin of folio 326, six quatrains said to be by Avicenna, though none is cited by Nafīsī. This manuscript is dated 25 Ṣafar 825/1422. Ḏ. Ṣafā has published a collection of Persian poetry ascribed to Avicenna (*Jašn-nāma-ye Ebn Sīnā* I, Tehran, 1331 Š./1952, pp. 111-15).

Apocryphal treatises. At the time of the millenary celebrations in 1331 Š./1952, the Anjoman-e Ātār-e Mellī (q.v.) in Tehran published a series of Persian *resāla*s (treatises), all short, which are stated in the manuscripts to be from the pen of Avicenna. All, however, contain evidence which throws doubt on the attribution, and none are mentioned in the list of Avicenna's works. G. Lazard had demonstrated the spuriousness of these *resāla*s in a detailed study ("Publications iraniennes à l'occasion du millénaire d'Avicenne," *REI* 22, 1954, pp. 153-55). Brief indications of the content of each are given below.

(1) *Resāla-ye nafs*, ed. M. ʿAmīd, Tehran, 1331 Š./1952. This is in fact one of two existing Persian translations of Avicenna's Arabic treatise on the soul, which bears six different titles in different manuscripts (see Y. Mahdawī, *Ketāb-šenāsī-e Ebn Sīnā*, Tehran, 1333 Š./1954, p. 244). ʿAmīd states that all the manuscripts which he used in preparing his edition attribute the translation to Avicenna himself. The language of this translation, however, differs greatly from that of the *Dāneš-nāma*, being full of Arabic words and technical terms not found in corresponding passages in the latter, such as *edrāk* (perception) on p. 19 instead of *andaryāft* as in the *Dāneš-nāma*, *Ṭabīʿīyāt*, p. 101; *qowwat-e ʿāmela* (agential faculty) on p. 24 instead of *qowwat-e konāʾī*; *qowwat-e ʿālema* (cognitive faculty) on p. 24 instead of *qowwat-e andaryāft-e naẓarī*. Furthermore we know from a statment of the translator of the other Persian version that Avicenna did not personally translate his treatise from Arabic into Persian; in the words of this translator in his preface, "A learned man had translated this *resāla* (here entitled *al-Maʿād*) into Persian, but on comparing the translation with the original text he found it defective, erroneous, and incomplete, and therefore, at a friend's request, made a new and more complete and accurate translation" (see Mahdawī, op. cit., p. 247).

(2) *Resāla andar ḥaqīqīyat wa kayfīyat-e selsela-ye*

mawjūdāt wa tasalsol-e asbāb wa mosabbabāt (Treatise on reality and the mode of connection of beings and the interconnection of causes and effects), ed. M. ʿAmīd, Tehran, 1331 Š./1952. This *resāla* is written in the form of questions and answers—a form not normally used by Avicenna. It is certainly apocryphal, not only because the vocabulary and phrasing, the constant reference to the Koran and citation of its verses in support of arguments, and the imprecision and logical unsoundness of the premises and inferences are untypical of Avicenna's authentic works, but above all because the assertions contradict Avicenna's teachings. The words *mostaʿār* (borrowed or metaphorical), *mostafād* (understood), *jāʾez* (allowed), *jāʾez al-wojūd* (allowed to exist), which recur from the answer to the first question onward, are not only un-Avicennian but also have meanings which conflict with Avicenna's concepts of *momken* (potential) and *momken al-wojūd* (potentially existent). The question whether the existence of the creator can be inferred from that of created beings is answered with the assertion of creation ex nihilo (*ebdāʿ*), which the Ashʿarite theologians postulated and Avicenna always rejected, counterposing his own theory of process (*ṣonʿ*) (*Dāneš-nāma*, [*Manṭeq, rāh-e jadalīān* ...] p. 95; *Ešārāt*, the whole chapter "Fiʾl-ṣonʿ waʾl-ebdāʿ;" and especially "Tanbīh," p. 153).

(3) *Meʿyār al-ʿoqūl* (Assay of minds), ed. J. Homāʾī, Tehran, 1331 Š./1952. The subject-matter, which is far removed from Avicenna's interests, and the use of Arabic terms such as *ṣolb* (spine), *teql* (weight), *rasan* (rope), which are not found in Avicenna's Persian prose, are sufficient proof of the inauthenticity of this *resāla*.

(4) *Qorāża-ye ṭabīʿīyāt* (Scrap of the natural science), ed. Ḡ. -Ḥ. Ṣadīqī, Tehran, 1331 Š./1952. In the first lines of his preface the editor acknowledges that this *resāla* has nothing in common, aside from the form, with Avicenna's Persian works. The presentation of problems, the advocacy of certain theories such as the teleological theory, the abundance of Arabic terms, and the peculiarities of the language, all prove that this short treatise is spurious.

(5) *Konūz al-moʿaẓẓamīn* (Treasures for great men), ed. J. Homāʾī, Tehran, 1331 Š./1952, a small manual on practical use of charms. There is also an Arabic version entitled *al-Nīranjāt* (Mahdawī, op. cit., p. 251). On the ground that all the manuscripts bear Avicenna's name, Homāʾī thought that this *resāla* must be authentic. It is difficult, however, to believe that Avicenna, who placed treatises on logic at the head of all his philosophical works and based his logic on axioms of pure reason, could have been led to teach magic arts with such conviction. Further proofs of inauthenticity are the differences of style and language from those of Avicenna's Persian writings, and the advice given in the preface to "keep this book away from the indiscretion of unqualified and unworthy persons."

(6). *Resāla-ye jūdīya*, ed. M. Najmābādī, Tehran, 1330 Š./1951, a short advice-book on prevention and, above all, cure of afflictions ranging from sneezes to fly-swarms and including snake-bites. The editor, himself a

doctor of medicine, is to be commended for the painstaking erudition with which he explains and comments on the recommended remedies. He accepts the attribution to Avicenna as authentic, and thinks that the title ought correctly to be *Resāla-ye maḥmūdīya* because the work is dedicated to the sultan Maḥmūd Ḡaznavī. Its prose, however, is in no way comparable with that of Avicenna's Persian works, and its counsels and remedies are too simple and credulous to be from the pen of any medical practitioner, even a country doctor, let alone the author of the canon of medicine. The dedication linking Avicenna to the sultan Maḥmūd is a further illustration of the forger's naïveté.

(7) *Ẓafar-nāma*, ed. Ḡ. -Ḥ. Ṣadīqī, Tehran, 1331 Š./1952, a small collection of maxims said to have been enunciated by Bozorgmehr in reply to questions put to him by Ḵosrow I Anōšīrvān. If so, it must have been translated from a Pahlavi text. The only external source in which the translation is attributed to Avicenna is Ḥājjī Ḵalīfa's *Kašf al-ẓonūn*, according to which the Samanid prince Nūḥ b. Manṣūr commissioned his minister Ebn Sīnā to render this collection of maxims from Pahlavi into Persian. All the evidence points to a confusion or a fictitious attribution. Avicenna did not know Pahlavi and was not Nūḥ b. Manṣūr's minister. Moreover, the language is not comparable with that of Avicenna's Persian works. Ṣadīqī writes interestingly on possible explanations in his excellent preface.

To the above list must be added a *resāla* called *Meʿrāj-nāma* [not seen by the present writer]. According to Mahdawī (op. cit., p. 297), the text has twice been published: first in facsimile, secondly in print ed. bu Ḡ.-Ḥ. Ṣadīqī in the Anjoman-e Āṯār-e Mellī series (Tehran, 1331 Š./1952. For a further list of works in Persian attributed to Avicenna see Ḏ. Ṣafā, *Tārīḵ-e ʿolūm-e ʿaqlī dar tamaddon-e eslāmī* I, 4th ed., Tehran, 1356 Š./1977, pp. 231-35 and idem, ed., *Jašn-nāma* I, pp. 57-63.

Bibliography: Works by Ebn Sīnā; *Dāneš-nāma-ye ʿalāʾī*, ed. S. M. Meškāt and M. Moʿīn, repr. Tehran, 1353 Š./1974. *Ketāb al-najāt*, Cairo, 1960 *Ketāb al-šefāʾ*, Cairo, 1952-83. *Ketāb al-ešārāt wa'l-tanbīhāt*, ed. Forget, Leiden, 1892. *Al-Qānūn fī'l-ṭebb*, Būlāq, 1294/1877; Eng. tr. by Q. C. Gruner. Ẓahīr-al-dīn Bayhaqī, *Ta'rīḵ ḥokamā' al-eslām*, Damascus, 1946. Ebn Abī Oṣaybeʿa, *Oyūn al-anbā' fī ṭabaqāt al-aṭebbā'*, ed. von Müller, Cairo, 1299/1882. Ebn al-Qefṭī, *Ta'rīḵ al-ḥokamā'*, Leipzig, 1903. Ṣafā, *Adabīyāt* II, pp. 625-28.

(M. ACHENA)

xii. THE IMPACT OF AVICENNA'S PHILOSOPHICAL WORKS IN THE WEST

Western European acquaintance with Avicenna began when Latin versions of some of his Arabic works came out in the period between the mid-twelfth and the late thirteenth century. These versions were products of a great translation movement which brought into being a large corpus of philosophical and scientific literature of Greek, Arabic, and Jewish origin and greatly influ-

enced medieval thought in the thirteenth century.

The best known of Avicenna's philosophical works in the Middle Ages was his encyclopedic *Ketāb al-šefā'* (Book of healing). This consists of a biography of Avicenna in a preface by his pupil Jūzjānī and of four *Summae*, i.e., collections (*jomal*, sing. *jomla*), dealing with particular disciplines, namely logic, physics, mathematics, and metaphysics. Each *jomla* is divided into *fonūn* (sing. *fann*), i.e., specialities or sections. Almost all of the Physics (*Ṭabīʿāt*, i.e., branches of natural science) and the whole of the Metaphysics (*Elāhīyāt*, i.e., branches of knowledge of God) were translated into Latin. The Mathematics (*Rīāżīyāt*) were not translated. The only parts of the Logic (*Manṭeq*) which were translated were the introduction (*Madḵal*), a chapter from section 5 on proof (*borhān*, i.e., by syllogism), and two passages from section 8 on rhetoric (*ḵeṭāba*); in all, about one tenth of the Arabic text.

Some of the translations were made during the second half of the twelfth century at Toledo, namely, (1) the introduction (*Madḵal*) to the Logic, preceded by the preface to the *Šefā'* and the chapter from the section on proof; (2) from the Natural Science, three quarters of section 1 (*al-fann al-awwal*) on physics in the strict sense (*al-Samāʿ al-ṭabīʿī*) and section 6 (*al-fann al-sādes*) which forms the Treatise on the Soul (*Ketāb al-nafs*); (3) the entire Metaphysics, i.e., the whole of the fourth *jomla*.

Section 8 (*al-fann al-ṯāmen*) of the Natural Science, which forms the Treatise on Animals (*Ḥayawān*) was translated about 1230 for the emperor Frederick II, King of Sicily.

The two passages on rhetoric were translated about 1240 for John, Bishop of Burgos.

Also at Burgos, translation of the Natural Science was resumed under the auspices of Bishop Gonzalvo Garcia de Gudiel, beginning with the part of section 1 which had been left unfinished at Toledo: Despite the work done at Burgos, the Latin text does not amount to a full translation of the Arabic text. The other translated parts of the Natural Science are sections 2, 3, 4, and 5, on the Heaven and the World (*al-Samā' wa'l-ʿālam*), Generation and Corruption (*al-Kawn wa'l-fasād*), Actions and Reactions arising from elemental qualities (*al-Afʿāl wa'l-enfeʿālāt*), and Meteorology, i.e., atmospheric phenomena (*al-Āṯār al-ʿolwīya*), respectively. Three chapters of the last-mentioned section had been separately translated toward the end of the twelfth century; we thus have a version of this part earlier than the Burgos version.

Section 7 of the Natural Science, which constitutes the short Treatise on Plants (*al-Nabāt*), was translated under the title *Liber de vegetabilibus*; this title is mentioned in the inventory of the great fourteenth-century library of the Sorbonne compiled in 1338, but it has not yet come to light (M. Th. d'Alverny, *Notes*, p. 348).

The names of almost all the chief translators of the *Šefā'* (though not of their assistants) are definitely known. They were Avendauth, an "Israelita philosophus," and the archdeacon Dominic Gundisalvi or

Gundissalinus, both mentioned in the letter dedicating the Treatise on the Soul to the archbishop John of Toledo; Michael Scotus, who dedicated the Treatise on Animals to Frederick II; Master John Gunsalvi and Salomon, mentioned in the part of the Natural Science translated at Burgos; Herrmann the German, mentioned in the preface to his translation of Aristotle's Rhetoric into which he inserted passages from Avicenna's Šefā'; and Alfred of Sareshel or Alfred the Englishman, the translator of the three extracts from the Meteorology (section 5 of the Natural Science).

On the other hand, the Latin manuscripts give contradictory indications of the role of Gerard of Cremona, who resided at Toledo contemporaneously with Dominic Gundisalvi and translated Avicenna's Canon on medicine. Some of the Latin terms used in the translation of the Metaphysics suggest that perhaps Gerard had a hand in it, but only one of the twenty-four known manuscripts names him as the translator. In three other manuscripts the translation is attributed to Dominic Gundisalvi, but these are not independent sources (Van Riet, Liber de philosophia prima I-IV, p. 123).

In addition to the Šefā', another philosophical work by Avicenna was known to the medieval Europeans, namely al-Adwīa al-qalbīya (Medicaments of the Heart), an essay on certain subjects also discussed in the Ketāb al-nafs. This short work was translated into Latin early in the fourteenth century by Arnaud de Villeneuve at Barcelona in 1306. Avicenna's disciple Jūzjānī had inserted a part of the essay into the Arabic text of the Ketāb al-nafs in view of the relatedness of the subject matter, and these chapters had already been translated into Latin at the same time as the whole of the De anima in the twelfth century (Van Riet, De medicinis cordialibus, fragmentum, in De anima IV-V, pp. 98*-99*, 115*-118*, 187-210).

Finally there are mentions of two more works of Avicenna in the book Pugio fidei written by the Dominican friar Raymond Martin in 1278. One is the Alixarat, i.e., the Ketāb al-ešārāt wa'l-tanbīhāt; the title is interpreted by Raymond Martin as Liber invitationum vel nutuum or as Liber invitationum et exercitationum, and ten lines in Latin translation are quoted. The other is Annage, i.e., al-Najāt, one page of which is translated into Latin (Cortabarria, L'étude des langues, pp. 233-34).

Avicenna's philosophical works formed the core of a large body of literature comprising other translations from Arabic and compilations in which Avicenna's translated writings were lumped together with texts of Christian and Neoplatonist authors. Dominic Gundisalvi himself also translated the Summa philosophiae of Algazel (Ḡazālī) and the Fons vitae of Ebn Gabirol, and reputedly compiled several treatises containing quotations of paraphrases from works by Avicenna such as De anima and De divisione philosophiae.

There is general agreement that a work falsely attributed to Avicenna, bearing the title Liber Avicennae in primis et secundis substantiis et de fluxu entis should

be placed in the category of compilations modeled on those of Dominic Gundisalvi. This work is included in the Opera philosophica of Avicenna printed at Venice in 1508 (pp. 64v-67v). Other copies with the title De causa causarum et fluxu earum were made and are to be found following De anima in several manuscripts (d'Alverny, Les traductions d'Avicenne, p. 81; cf. Avicenna latinus). As Gilson (Les sources gréco-arabes, pp. 92-93) observed, "it is almost certainly a Christian work written by an author who borrowed at random from writings of Dionysius, St. Augustine, Erigena, and Avicenna. Such unthinking and unrestrained imitation of Avicenna only appeared in the last two-thirds of the 13th century." The author propounds the concept of the soul's illumination through a separate substance, as taught by Fārābī and Avicenna, and attempts to synthesize this with St. Augustine's teaching; Avicenna's active intellect (dator formarum) is identified with St. Augustine's illuminator-God, who thus becomes the active intellect of the human species. The complex of ideas prevalent in this historic phase, as attested by the syntheses of Arab and Christian Neoplatonism, is called "Avicennizing Augustinism" by Gilson (op. cit., p. 103) and "Latin Avicennism" by de Vaux (Notes et Textes, pp. 63f.). These terms are questioned by certain historians of thirteenth-century philosophy (Van Steenberghen, La philosophie, pp. 17-18 and 185-87). In any case the doctrine identifying the active intellect, as a separate substance, with the Father of Light or Word of God continued for decades to be attractive to many minds, e.g., Roger Marston and Marsilio Ficino (Goichon, La philosophie d'Avicenne, pp. 113-14).

In the first third of the thirteenth century, Avicenna's works were no longer studied only in connection with writers of Neoplatonic inspiration such as pseudo-Dionysius, St. Augustine, John Duns Scotus, or Erigena; they were also used in the study of Aristotle. Avicenna's own paraphrases of Aristotle "met the needs of the first Aristotle-interpreters until superseded by Averroes's literal commentaries. Before the Western Christians became acquainted with Averroes, Avicenna's influence on Latin Aristotelianism was very marked" (Van Steenberghen, La philosophie, pp. 186-87).

As early as 1210, a synod at Paris banned the reading of Aristotle's "libri de naturali philosophia" and "commenta" thereon. In 1215 the ban was reaffirmed and clarified by Robert de Courcel, the legate of Pope Innocent III, in one of the regulations specifying what might be taught in the faculty of arts: "Non legantur libri Aristotelis de metaphisica et de naturali philosophia nec summae de eisdem" (Aristotles' books on metaphysics and natural philosophy must not be read, nor the "summaries" of same). Historians suggest somewhat divergent explanations of these bans, having regard to the circumstances and to the identities of the suspect teachers (Amaury of Bène, David of Dinant, and others), but all agree that the words "commenta" and "summae" refer definitely, if not exclusively, to the

paraphrases of Avicenna. It is noteworthy that the prohibition applied only to the teaching of these texts, not to personal reading and use of them, and that its scope was strictly local. Thus in 1229 the books of Aristotle and commentaries thereon which were under interdict at Paris could be read and taught at the nascent university of Toulouse (Van Steenberghen, *La philosophie*, p. 92).

Several writers active about 1240, such as Guillaume of Auvergne, Alexandre of Hales, Jean of La Rochelle, show in their comments or censures that they had precise knowledge of Avicenna's *De anima*, of his analysis of the faculties of the soul, his theory of abstraction, and his classification of intellects.

Various works of Avicenna enter prominently into the great philosophical-scientific encyclopedia of Albertus Magnus, who started work on it toward the middle of the thirteenth century, just at the time when Aristotelianism was triumphing at Paris. His wish was to "rehash Aristotle for use by the Latins" and to "place within reach of the studious all the scientific findings made by the human mind up to his own time" (Mandonnet, *Siger* I, pp. 37-39). Rather than the literal commentaries on Aristotle's works, he cites the paraphrases of Avicenna. He also makes frequent use of Avicenna's own works, most often not explicitly, in quotations which have not yet all been identified (Van Riet, *Liber de philosophia prima* I-IV, pp. 159*-163*). The philosophy of Albertus Magnus, as presented in his encyclopedia, may therefore be described as a Neoplatonized , and above all Avicennized, Aristotelianism (Van Steenberghen, *La philosophie*, p. 303).

Thomas Aquinas's writings contain more than 400 explicit quotations of Avicenna, drawn mainly from *De anima* (section 6 of *De naturalibus*) and the *Metaphysica* and in some cases from the Physics in the strict sense (*Sufficientia*). On the basis of a solid exegesis of Aristotle made in the light of Averroes' criticisms, Thomas Aquinas endorses or rejects the quoted theses of Avicenna, thereby putting them into sharper perspective. He does this in his discussions of God the Creator, God's providence, the real distinction between essence and existence in finite beings, the analogy of being, and the notion of the necessary (which he drops in his list of the transcendental attributes) (Verbeke, *Le statut*, p. 36).

Following the examples set by Albertus Magnus and Thomas Aquinas after him, it became customary to incorporate the gist of the Toledan translations of Avicenna and also materials from the *Liber de animalibus* in large-scale syntheses and thus to engulf them in a mass of texts of other authors such as Aristotle, Boethius, Proclus, and Averroes. This at least facilitated comparisons of different doctrines, with fruitful effects on the works of later writers such as Henry of Ghent, Godefroid of Fontaines, John Duns Scotus, Marsilio Ficino, Caietano, and others. Avicenna's future standing in the West was to be tied to that of the works in which so many ideas taken from him had been integrated (Goichon, *La philosophie*, p. 127).

Less is known about the process of diffusion of the *Libri naturales*, sections 2 to 5, which were translated at Burgos after the death of Thomas Aquinas in 1274 and probably not long before that of Albertus Magnus in 1280. The texts of these books are not included in the *Opera philosophica* of Avicenna printed at Venice in 1508 and have not yet been systematically studied.

In the sixteenth century, several short philosophical works of Avicenna were translated from Arabic into Latin by the physician-philosopher Andrea Alpago of Belluno, but these new translations did not have any leavening effect on contemporary Western thought.

The tally of the work done in the past thirty years gives promise of a revival of Avicennian studies in the West in the coming decades, with particular attention to the *Šefā'*. The new Arabic edition of the *Šefā'*, which the Ebn Sīnā Committee at Cairo began to publish in 1952, was completed with the printing of the Physics (*al-fann al-awwal men al-Tabī'īyāt*) in 1983. This edition provides the essential basis for studies of the Latin versions. The inventory of the Latin manuscripts begun by M. d'Alverny in 1952 has also been completed. The first critical editions of *De anima* and the *Metaphysica*, prepared by S. Van Riet, came out in 1968-72 and 1977-80-83 respectively. A critical edition of the *Libri naturales* is in progress.

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(S. VAN RIET)

xiii. THE INFLUENCE OF AVICENNA ON MEDICAL STUDIES IN THE WEST

From the early fourteenth to the mid-sixteenth
century Avicenna held a high place in western European
medical studies, ranking together with Hippocrates and
Galen as an acknowledged authority. His works had a
formative influence on the scholastic medicine of the
later Middle Ages, and at some places continued to be
used for teaching up to the eighteenth century.

Although Avicenna was more of a philosopher and
natural scientist than a physician, the Europeans saw
him primarily as the *princeps medicorum* (prince of
physicians), in contrast with the Muslims who revered
him as the *šayk-al-ra'īs* (chief master, i.e., of all the
sciences). It is not yet possible, however, to assess his
impact on the rise of scientific medicine in the West
because systematic studies of the various fields are still,
on the whole, lacking. A catalogue of the manuscripts of
Latin versions of Avicenna's writings on medicine is still
a desideratum, and there is no critical bibliography of
the printed editions which came out in the fifteenth,
sixteenth, and seventeenth centuries.

Three medical works by Avicenna were available in
Latin versions in the later Middle Ages: *al-Qānūn fi'l-
ṭebb*, a five-book medical encyclopedia translated as
Canon medicinae and provided with a glossary by
Gerard of Cremona (d. 1187) at Toledo in the second
half of the twelfth century; *al-Adwīa al-qalbīya*, a
treatise on psychiatry translated as *De viribus cordis* (On
the powers of the heart) by Arnald of Villanova
(d. 1311) at Barcelona in 1306; *al-Orjuza fi'l-ṭebb*, a
medical manual in verse rendered into Latin prose
under the title *Cantica* by Arnald's nephew Armengaud
Blasius (d. 1312) at Montpellier in 1294, together with
Ebn Rošd's commentary thereon. The last two trans-
lations were wrongly attributed to Gerard in certain
early printed editions.

The *Canon* translation was one of the fruits of the
endeavors of the twelfth-century Toledan school of
translators to open up the whole range of Arabic

learning. They took particular interest in philosophical
and theoretical writings. This phase in the Western
reception of Greco-Arabic medicine had been
preceded in southern Italy about a century earlier
by one of greater concern with practical matters.
Starting from Salerno, early scholastic medicine
with a scientific approach based on Arabic material
had spread into the medical schools and the new
universities of France and Italy (Baader, "Reform-
denken," pp. 268f.), preparing the ground for accept-
ance of the *Canon*. This work met the needs of the
new scholastic medicine in three respects: (1) with
its immense wealth of information, it provided
Western physicians with a synopsis of virtually all the
knowledge amassed in the preceding 1500 years and
stimulated them to work further on their own; (2) with
its systematic incorporation of every subject, down to
the smallest detail, in a well-ordered theoretical frame-
work, it greatly facilitated the adoption of its contents
for teaching and at the same time satisfied the scholastic
liking for a logical classification of subject matter; (3)
last but not least, Avicenna linked the medicine of
Galen to the natural philosophy and theory of science of
Aristotle, who from the thirteenth century onward
dominated intellectual life in Europe. Avicenna's Ar-
istotelian views on basic questions of biology (e.g., the
central organ of the body, the roles of the sexes in
reproduction) provided starting points for discussions,
typical of the scholastic medicine of the time, about the
discrepancies between philosophers and physicians, i.e.,
between Aristotle and Galen, and thereby prompted
new efforts to solve old problems.

The *Canon* came into use among medical scholars
during the thirteenth century (mainly the second half)
and in university courses during the fourteenth century,
when commentaries providing the groundwork for
interpretation by professors (*magistri*) first became avail-
able. Key roles in this field appear to have been played
by pupils of Taddeo Alderotti (d. 1295) at Bologna,
particularly by Dino del Garbo (d. 1327) who for the
first time systematically elucidated large parts of the
Canon (Siraisi, pp. 96f., 105-09). As to the first introduc-
tion of the *Canon* into academic curricula, direct
evidence is lacking for the Italian universities. The
earliest testimony is a syllabus for mastership candi-
dates at the university of Montpellier included in a
papal bull of 1309. The *Canon* is recommended in this
document as one of a number of optional textbooks. By
1340, however, it had been firmly established in the
various course programs. Arabic science was long to
maintain a strong position at Montpellier, where lec-
tures on Avicenna's works often went far beyond what
was required by the syllabus; as late as 1545 he still
clearly ranked above the ancient Greek authorities
(Germain, *La médecine*, pp. 9-12). At Paris the *Canon* is
first mentioned as lecture material in 1330, and it also
appears in the library catalogue of the medical faculty
made in 1395 (Seidler, *Die Heilkunde*, pp. 49f.). Follow-
ing the example of Paris, German universities founded
in the fourteenth and fifteenth centuries also admitted

the *Canon* to their programs of study.

Academically trained physicians in the later Middle Ages undoubtedly were familiar with the entire *Canon*. Lectures, however, were concentrated on certain parts of the work, with slight local variations in choice and range. The compulsory teaching matter always included the part on physiology in the first *fen* (transcription of the Arabic *fann*) of book 1, which expounds the general principles of medicine, and the theory of fevers (*Canon* 4.1), sometimes together with the theory of crises (4.2). Often the three remaining *fens* of book 1—on etiology and symptomatology, dietetics and general therapy— were also prescribed. Book 3, on the specifics of pathology and therapy, was by reason of its vast range less often used as lecture material, and then only in excerpts, but it was a favorite source for examination questions. In some universities book 2 on materia medica was read together with other pharmaceutical treatises of Arabic origin. For surgical training, in so far as this took place on the academic level, Avicenna's surgery (*Canon* 4.3-5) was among the standard textbooks.

This selection was of course influenced by the wealth of commentaries on the *Canon*, which in the absence of a systematic inventory (a first attempt by Eckleben has left many gaps) can not yet be adequately surveyed. The most numerous are exegeses of *Canon* 1.1 and 4.1. No Latin commentary on the entire work is known to exist. The most comprehensive commentary, produced by Jacques Despars (d. 1458) after more than twenty years' work and printed *in toto* at Lyons in 1497-98, deals only with *Canon* 1.3 and 4 (Jacquart, *Un médecin*, pp. 109-12). Outstanding among the numerous exponents who wrote in the heyday of *Canon*-exegesis in the fourteenth and fifteenth centuries were certain professors of the then pre-eminent north Italian universities, whose commentaries were widely used as textbooks and quite frequently printed after the introduction of printing in the mid-fifteenth century. In addition to Dino del Garbo (see above), Gentile of Foligno (d. 1348), Ugo Benzi of Siena (d. 1439), and Jacopo of Forlì (d. 1414) dealt with several parts of the *Canon*; others, like Giovanni Matteo Ferrari of Grado (d. 1472) and Giovanni Arcolani (d. 1458), commented only upon individual sections. Leonardo of Bertapaglia wrote a commentary on the surgical chapters in 1424 (Thorn-dike, *Science and Thought*, pp. 60-65). As Jacquart (*Le regard*, pp. 43-76) has shown in the case of Despars, the exegetic writings were often amplified with personal observations and experiences of their authors. These hitherto neglected sources are therefore likely to provide interesting evidence of the ways in which the *Canon* stimulated new developments in Western medicine. It was a main source for many medical manuals and monographs and it was sometimes also taken as a model of form; for example, the collection of medical counsels by Ferrari of Grado (Venice, 1514 and several times reedited) is arranged according to the method of Avicenna.

The *Canon* was one of the medical books most frequently printed in the fifteenth and sixteenth centuries. Incunabula from before 1500 were for the most part printed in Italy; they comprise eleven complete editions (among which the five-volume Venice edition of 1490-95 is supplemented with commentaries by various authors) and two partial editions. The earliest printed edition (1472) consists only of *Canon* 3, the Bologna edition (1482) only of *Canon* 4.1, 3-5. A Hebrew version was printed at Naples in 1491-92. Up to 1608, fourteen more complete editions of the Latin version were printed, including three with commentaries, as well as an epitome by Michael Capella (*Flores Avicennae*, Lyons, 1508, 1514) and an alphabetically arranged adaptation by Gabriel of Tarrega (Bordeaux, 1520, 1524). To these must be added excerpts published in compilations, particularly collected doctrines of the three principal authorities, Avicenna, Galen, and Hippocrates, and the lemmata in the numerous commentaries. The original Arabic text was printed at Rome at 1593, but like all products of the Medici press was intended primarily for export to the East.

Most of the printed editions of the *Canon* included two other works of Avicenna which played a minor role in university teaching. These were *De viribus cordis* (initially in the Paduan edition of 1476, but also printed separately at Lyons in 1527 with a commentary by Jaime López of Calatayud) and the *Cantica* (initially in the Venetian edition of 1482-83). The *Cantica* and Ebn Rošd's (Averroes') commentary on them were printed together at Venice, 1483, and in Ebn Rošd's *Opera* at Venice, 1484, and were included with the other principal texts from the *Canon* in some printings of the textbook *Articella* (e.g., Venice, 1509; Lyons, 1519, 1534).

From the end of the fifteenth century onward, efforts were made to remedy the linguistic deficiencies of the medieval version of the *Canon*, e.g., its clumsy word-for-word renderings and many transliterated borrowings of Arabic terms. Andrea Alpago (d. 1522), who had acquired a deep understanding of both the language and the subject during his thirty years of service as physician to the Venetian embassy at Damascus, supplied emendations derived from Arabic manuscripts to the Latin versions of the *Canon*, the *Cantica*, and *De viribus cordis* (which he more accurately entitled *De medicamentis cordialibus*), and compiled a new glossary, mainly of Arabic names of drugs. His corrections were published posthumously in 1527 by his nephew Paolo in the first edition of the *Canon* from the Giunta press at Venice (d'Alverny, "Avicenne," pp. 184-89). The later Giuntine editions of the 1544, 1555 (reprinted at Basel in 1556), 1562, 1582, 1595, and 1608 were based on Alpago's revised text, from 1555 onward augmented by marginal notes—taken from Alpago's manuscript—by Benedetto Rinio, which show parallel readings in ancient Greek and Arabic works (d'Alverny, pp. 196f.). To facilitate reference, an index by Giulio Palamede was also printed (Venice, 1557, 1584).

Alpago's was to be the only textual revision of the entire *Canon*. Andrea Grazioli brought out a new

version of only book 1 (Venice, 1580) based on an unfinished translation by Girolamo Ramnusio (d. 1486), Alpago's predecessor at Damascus (d'Alverny, pp. 182-84). Another translation by Miguel Jerónimo Ledesma (Valencia, 1546) went no further than *Canon* 1.1. Jacob Mantino's translations of *Canan* 1.4 (five editions between 1530 and 1555) and *Canon* 3.1.1.29 (on headache; Bruges, 1538) and the translation of excerpts from *Canon* 3.1-2 by Jean Cinqarbres (Paris, 1570, 1572) are not from the original Arabic but from the Hebrew version, while Jean Bruyerin's new rendering of the book on heart drugs (Lyons, 1559) was from the Arabic.

Western Europe also has to thank Andrea Alpago for his translation of two other medical treatises by Avicenna, *De removendis nocumentis quae accidunt in regimine sanitatis* (On harmful things in the regulation of health which have to be prevented—*Dafʿ al-mażārr al-kollīya ʿan al-abdān al-ensānīya*) and *De syrupo acetoso* (On oxymel—*sekanjabīn*), as well as the only Latin versions of two Arabic commentaries on the *Canon*, those of Qoṭb-al-dīn Šīrāzī on books 2, 3, and part of book 4, and of Ebn al-Nafīs on book 5 (pharmacopeia), in which, incidentally, there is no mention of Ebn al-Nafīs's discovery of pulmonary circulation. These four texts were published by Paolo Alpago at Venice in 1547; the first two were also appended to several later editions of the *Canon*.

But even the availability of these new texts and the improved versions of previously known works could not arrest the growing rejection of Avicenna's authority in the universities. In the context of humanist efforts to reform medicine, criticism of the *Canon* spread and gained strength in the course of the sixteenth century. The most spectacular onslaught was the public burning of the *Canon* by Paracelsus in the Midsummer-Day bonfire at Basel in 1527—though a gesture admittedly motivated by his rejection of all written authorities, and by no means typical of the age. In general the humanist critics of Arabic medicine, who made Avicenna their prime target, strove for a revival of ancient Greek and Roman medicine. Scholars such as Niccolò Leoniceno, Giovanni Manardi, Symphorien Champier, Janus Cornarius, and Leonhart Fuchs, who were intent on demolishing the medieval system, dismissed its textbooks of Arabic origin as verbal and factual misrepresentations of ancient teachings and replaced them by newly recovered Greek and Latin medical writings. Their criticism of detail focused mainly on Avicenna's prescriptions, where the indications and dosages differed from the ancient traditions. On the other hand, Avicenna's innovations were praised as practical advances by his defenders, such as Sébastien Monteux, Bernhard Unger, and Lorenz Fries.

Although the scholastic features of academic medicine were not finally discarded until the eighteenth century, in the choice of subjects for study it was the humanistic tendency that prevailed. In the second half of the sixteenth century, the *Canon* gradually fell out of the syllabus at most European universities, though it

was still taught by individual professors, e.g., by Werner Rolfinck at Jena in 1670. It remained obligatory well into the eighteenth century at the Spanish universities of Valladolid and Salamanca (Gonzalez, p. 20) and likewise at Padua, where Giovanni Battista Morgagni, the founder of morbid anatomy, still lectured on its first book in 1712-15—just as Santorio Santorio, one of the pioneers of experimental medicine, had done a century before him (Pazzini, "Manoscritti," pp. 179-82). It would appear, however, that these teachers used the set text mainly as background for the presentation of more recent knowledge; for example, Santorio in his commentary (Venice, 1625, 1626) describes instruments which he himself had invented (clinical thermometer, pulse meter).

Work on the preparation of more accurate Latin versions continued in the seventeenth century. Preoccupation with Arabic on the part of physicians seeking better comprehension of the *Canon* even contributed to the advance of Arabic philology at that time (Fück, pp. 57-59). In 1624 Zacharias Rosenbach attempted to introduce an Arabic language course for medical students at the Herborn academy (Grün, pp. 64f.). In 1609 Peter Kirsten, a physician of Breslau, brought out an Arabic-Latin edition of the materia medica (*Canon* 2). Vopiscus Fortunatus Plemp, who lectured on Avicenna at the university of Louvain, could not fulfill his plan to retranslate the whole of the *Canon* but published new translations of books 1 and 2 and part of book 4 in 1658. At Paris in 1659 a translation by Pierre Vattier of 16 chapters from *Canon* 3.3-4 on mental diseases (one of the highlights of the work on account of its penetrating differentiations) appeared under the title *De morbis mentis*. Georg Hieronymus Welsch in his *Exercitatio de vene medinensi* (Augsburg, 1674), an overexpanded commentary on Avicenna's short discussion of the Medina worm (*Canon* 4.3.8.4), quotes passages in the original Arabic accompanied by his own translations. Finally Avicenna's didactic poem *al-Orjūza* was retranslated into Latin by the Netherlander Anton Deusing under the title *Canticum* (Groningen, 1645). These philological as well as medical contributions already mark the transition to a purely historical interest in the *Canon*.

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(U. WEISSER)

ĀVĪSAN, wild thyme. The genus *Thymus* of the family *Labiatae* (Mint) comprises a number of fragrant aromatic undershrubs, with very small leaves and whorls of small purplish, nectar-bearing flowers in the axils of the leaves or at the ends of the branches. The Kotschy thyme (*āvīsan-e bārīk, Thymus kotschyanus* Boiss. et Hohen., locally called *avīsam, avšam, ābšan, āyšūm* [Alborz, Lār], *odšan, ušan, ošna-ye kūhī, sa'tar, kaklik-oti* [Šarafkāna in Azerbaijan], *kālvāš* [some northern districts], *āzorba* [Ganjnāma of Hamadān,

used for both *Thymus kotschyanus* and *Thymus serpillum*], *jowšan-e šīrāzī* [in the bazaars of Tehran], Ar. *sa'tar/sa'tar*) is a low perennial, strongly aromatic, wild undershrub with many varieties distributed in the higher regions of northwest Iran, in the Alborz mountains, and in Khorasan. Dried leaves and floral tops, which contain oil of thyme, are used for flavoring soups, sausages, sauces, and various vegetable and meat dishes. Aqua or *'araq-e āvīšan*, used for flavoring sherbets, is obtained by soaking dried leaves and floral tops in water. Around Tehran dried *āvīšan* is used with a refreshing drink made of a mixture of yogurt, water, and salt (*dūḡ*).

Mother-of-thyme (*Thymus serpillum*, locally *ošm, ošma, āzorba*) in another widespread thyme of Iran. Both thymes are carminative, stomachic, diuretic, digestive, and flatulent. They may be used for liver and respiratory disorders. *Makzan al-adwīa* (p. 256) and *Tohfa-ye Ḥakīm Mo'men* (pp. 563-64) attribute the apperitive, diuretic, vermifuge, emmenagogue, and antiacid properties of thyme.

Āvīšan-e Šīrāzī is one of the species of the genus Zataria.

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(R. A. PARSA)

AVROMAN (Hawrāmān, Persian Owrāmān), a mountainous region on the western frontier of Persian Kurdistan. It extends for approximately 50 km, from a point west of Marīvān (46° 0′ east longitude, 35° 30′ north latitude) south-eastwards to the confluence of the two branches of the river Sīrvān (46° 20′ east longitude, 35° 10′ north latitude). The Kūh-e Owrāmān range has several peaks of over 2,000 m, the highest being Kūh-e Takt, 2985 m. It is continued south of the Sīrvān by the Kūh-e Šāhō, which rises to 3,223 m. Parallel to these, east of the Sīrvān, is the Kūh-e Sālān, 2,597 m. The chief products of the area are various orchard fruits, walnuts, gall-apples (for tanning), and terebinth mastic.

The territory has four divisions: Owrāmān-e Lohon, southwest of the main range; main village, Nowsūd: Owrāmān-e Takt, north of Kūh-e Takt; main village, Šahr (Šār)-e Owrāmān: Dezlī, further north: Razāb (Razāw), around the Kūh-e Sālān. The population of the valley numbers perhaps 10,000 persons. They are distinguished from the Kurds, who surround them on all sides, to some extent by their traditional dress, but especially by their language (see Avromani), which is an archaic dialect of the Gōrāni group. They pay allegiance to branches of the Bagzāda family, which traces its