tradition of natural history been able to be an integral aspect of Muslim learning and remain in harmony and conformity with the spiritual and intellectual perspective of Islam.

BIBLIOGRAPHY

E. G. Browne, *Arabian Medicine*, Cambridge, 1921; D. Campbell, *Arabian Medicine*, 2 Vols, Kegan Paul, London, 1926; B. Carra de Vaux, *Les penseurs de l'Islam*, 5 Vols., P. Geuthner, Paris, 1921–27; Fr. Dieterici, *Die Naturschauung und Naturphilosophie der Araber im zehnten Jahrhundert aus den Schriften der Lautern Brüder*, Verlag der Nicolai'schen, Berlin, 1861; H. Ethé, *Die Wunder der Schöpfung*, Leipzig, 1868; ibn al-Qifṭi, *Tārīkh al-Ḥukamā'*, ed. A. Müller and J. Lippert, Leipzig, 1903; ibn Qutaibah, *The Natural History Section from a 9th Century "Book of Useful Knowledge": The 'Uyūn al-Akhbār of ibn Qutaibah*, tr. L. Kopf, E. J. Brill, Leiden, 1959; ibn Sīna, *Kitāb al-Shifā' (Ṭabī'iyāt)*, lithograph edition, Teheran, 1882; *A Treatise on the Canon of Medicine, Incorporating a Translation of the First Book* by O. C. Grunner, Luzac and Co., London, 1930; Ikhwān al-Ṣafa, *Dispute between Man and the Animals*, tr. J. Platts, W. H. Allen & Co., London, 1869; *Rasā'il*, 4 Vols., Cairo, 1928; A. 'Isa Bay, *Tārīkh al-Nabāt 'ind al-'Arab*, Cairo, 1944; P. Kraus, *Jābir Ibn Ḥayyān*, 2 Vols., Imprimerie de l'Institut Francais d'Archéologie Orientale, 1942–43; L. Leclerc, *Histoire de la Médicine arabe*, Paris, 1876; *Traités des simples par ibn al-Beithar, Notices et Extraits*, Vols. XXIII, XXV and XXVI, 1877 and 1883; B. Lewin, *The Book of Plants of Abu Ḥanīfah al-Dinawari*, A. B. Lundeguistska Bokhandeln, Upsala, 1953; Mas'ūdi, *Meadows of Gold and Mines of Gems*, tr. Sprenger, W. H. Allen & Co., London, 1841; A. F. Mehren, *Manuel de la cosmographie du moyen-âge*, Copenhagen, 1874; *Geschichte der Botanik*, Verlag der Gebrüder Bombträger, Königsberg, 1856; A. Mieli, *La science arabe et son rôle dans l'évolution scientifique mondiale*, E. J. Brill, Leiden, 1939; A. Mingana, *Encyclopaedia of Philosophical Sciences as Taught in Baghdād in c. 817 A. D., or Book of Treasures of Job of Edessa*, Cambridge, 1935; Mustaufi Qazwīni, *Nuzhat al-Qulūb*, Shīrāzi, Bombay, 1311/1893; E. Nordenskiöld, *History of Biology*, Kegan Paul, New York, 1946; A. Qazwīni, *Cosmographie*, ed. F. Wüstenfeld, Göttingen, 1848–49; G. Sarton, *Introduction to the History of Science*, 3 Vols., Baltimore, 1927–48; E. Wiedemann, "Beiträge zur Geschichte der Naturwissenschaften," *Sitzungsberichte d. phys. w. med. Soc.*, Erlangen, 1904–29.

Chapter LXVII

MEDICINE

A

INTRODUCTORY

It was not until nearly a hundred years after the conquest and consolidation of their empire that the Muslims turned their minds towards creative pursuits. It is remarkable in this context to find how quickly they directed their activities to productive ploughshares and prolific pens. Soon the Muslim Empire extended

from Andalusia to the Indus, and its various parts vied with one another in producing intellectual giants in every branch of art and science. Nearly half a century ago Fonahn[1] enumerated no less than one hundred and fifty-one works on Persian medicine alone during this period and Max Meyerhof[2] says that "the treasure-houses of Islamic science are just beginning to be opened. In Constantinople alone there are more than eighty mosque libraries containing tens of thousands of manuscripts. In Cairo, Damascus, Moṣul, Baghdād, as well as in Persia and India there are other collections. . . . Even the catalogue of the Escorial Library in Spain which contains a part of the wisdom of Western Islam is not yet complete." The subject of Muslim medicine is so vast that in the following pages only a bird's-eye view of it can be given.

For a proper appraisal of the Muslim contribution to medical science it is important to ascertain its position in Arabia at the birth of Islam. The country, as everyone knows, was at the time torn by internecine wars and family feuds. Ignorance was abysmal and education non-existent. The city surgeon *(jarrāḥ)* cauterized wounds, sustained in war, or applied obscure ointments as healing balms, and the village apothecary administered simples for simple ailments. People generally were living under most unhygienic conditions. Such was the dismal medical background when the Prophet of Islam started preaching. Early in his career he said that knowledge was of two kinds, that of religions and that of the bodies (i.e., of medicine). Inspired by the Qur'ānic injunction,[3] he preached moderation in all walks of life. Realizing the miserable lack of medical facilities, he advocated prophylactic measures as is evident from the following.

Sa'di,[4] the great Persian poet, philosopher, and traveller, relates the story of an eminent Persian physician who was sent by the Persian king to the Prophet to minister to his own as well as to his followers' needs. For a long time after the physician's arrival in Mecca no one called on him or sought his treatment. Driven by *ennui* he approached the Holy Prophet and complained of his forced odium. The Prophet's reply was: "These people do not eat until they are hungry nor drink until thirsty and then cease eating while a desire for food still remains." That must be the reason for their perfect health, said the physician. But medicine was not the Prophet's mission. He had dedicated himself to the moral and spiritual uplift of humanity at large. Winwood Reade[5] says, "Muhammad's career is the best example that can be given of the influence of the individual in human history. That single man created the glory of his nation and spread his language over half the earth. The words which he preached to jeering crowds are now being studied by scholars in

---

[1] Fonahn, *Zur Quellenkunde der persischen Medizin.*
[2] Max Meyerhof, "Science and Medicine," *The Legacy of Islam*, 1942, p. 311.
[3] Qur'ān, vii, 31.
[4] Sa'di, *Gulistān*, Vol. III, p. 6.
[5] Winwood W. Reade, *The Martyrdom of Man*, Walts & Co., London, 1872, p. 214.

London, Paris and Berlin . . . and in obscure villages situated by obscure streams." According to Browne,[6] the Prophet's biggest miracle was that he brought unity among the fighting Arabs with the result that they adopted one goal; and soon the Arabs as one nation became rulers of half of the civilized world. Care of the sick and wounded was but one facet of the Prophet's humanitarian personality. As pointed out by Wāsṭi, the so-called *Ṭibb-i Nabawi* is not, therefore, to be confused with any medical treatise as such.[7] The book is not taught in any recognized medical Yūnāni institution (as remarked by Browne), nor is it credited by Ḥakīms and scholars of Arabian medicine.

The only known physician in Prophet's time was al-Ḥāriṯh ibn Kaladah, an Arab Jew who later embraced Islam. He had studied medicine at Jundi-Shāpūr school of medicine in Persia. He used to be consulted at the time of dire necessity, and he mainly advised moderation. Among the surgeons of this time the last known was ibn abi Ramṣiah of the tribe of Tamīm.

The Arabs adopted their medical theory chiefly from the Hippocratic and Galenic systems, though there were plentiful translations from Syriac, Persian, Indian, and Egyptian authors as well. The Hippocratic system, as is well known, is based on the humoral theory, i.e., the four humours of the body: blood, phlegm, choler, and melancholy. This system served the Arabs and Persians for five hundred years as it had served the Greeks and Romans for a thousand years before that. The Persians carried the humoral theory a step further by identifying the four humours with the four elements of nature, i.e., air, fire, earth, and water. Browne,[8] however, defines Arabic medicine as one which has been presented in Arabic and considers that a large portion of it has been derived from the Greeks, though contributions have also been made by Indians, Persians, and scholars of other countries. He further states that during the period between the downfall of the Greeks and the Renaissance of Europe, the Arabs kept up the medical traditions and subsequently Europe was benefited by their treasure of learning.

Wāsṭi[9] remarks that the Arabs not only translated the old medical books but also prepared their abstracts, commented upon them, enriched them, and improved upon them. In his support Cumston[10] states, "It has been regarded for a long time that the Arabs slavishly copied the Greeks, rather they stood in the way of progress in medicine. But this is a wrong conception, because when the Arabs came into the field, Greek medicine had completely vanished and everywhere charm and magic were practised. At that moment the Arabs

[6] E. G. Browne, *Arabian Medicine*, Urdu translation with commentary by Sayyid 'Ali Aḥmad Nayyar Wāsṭi, p. 15.
[7] *Ibid.*
[8] *Ibid.*, p. 13.
[9] *Ibid.*, pp. 164–66.
[10] C. G. Cumston, *An Introduction to the History of Medicine*, London, 1926, p. 185.

not only saved the Greek knowledge from destruction but popularized Greek medicine by commenting and improving on it and subsequently created a taste for scientific learning in Europe. Even if the Arabs had only restricted their activities to collecting and translating Greek medical books into Arabic and had transmitted this knowledge to Europe again, it would not have been a mean achievement. But they stepped further and wrote original books." While the Greeks surpassed all other peoples in their achievements in antiquity, the Muslims did so in the Middle Ages. Their works written in Arabic were, in Sarton's words, "the most original, the most valuable and the most pregnant." Arabic became a most progressive and scientific language from the middle of the second/eighth to the end of eleventh/fifteenth century. In the contemporary West there were hardly any names as glorious as those of 'Ali al-Ṭabari, Aḥmad al-Ṭabari, al-Rāzi (L. Rhazes), 'Ali ibn al-'Abbās (L. Haly), ibn al-Baiṭār, abu al-Qāsim al-Zahrāwi (L. Abulcasis), and ibn Sīna (L. Avicenna). In fact, this was precisely the period which is known as the dark age of the West.[11]

The spread of Greek traditions was stifled in the West by the extreme Roman utilitarianism which was followed by the theological expediency and later by a theological domination which seemed for a long time to destroy every hope of genuine scientific revival. After the birth of Islam, the Arabs on the other hand were fired with the zeal for knowledge. The following sayings of the Prophet exhibit the importance he attached to the seeking of knowledge:[12]

1. Seek ye knowledge from the cradle to the grave.
2. To seek knowledge is the duty of every Muslim man and woman.
3. Seek ye knowledge even if it be in China.
4. The ink of the scholar is more holy than the blood of the martyr.
5. He who leaveth his home in search of knowledge walketh in the path of God.
6. He dieth not who seeketh knowledge.

In medicine the Arabs translated Hippocrates, Galen, and Dioscorides. Cumston says that the Arabs extracted the most important material from Greek writings and placed it in relief, leaving aside everything that was superfluous.[13] One has merely to read Galen and afterwards ibn Sīna in order to see the difference. The former was obscure, the latter perfectly clear; order and method reign in the latter, which in the former we seek in vain.

Khairallah, in evaluating the contribution of Muslims to medical sciences, enumerates the reasons which militated against their work. For instance, most of the Arabic books and manuscripts have been lost; a bare one per cent has been salvaged so far. The Mongol hordes carried death and destruction in their

[11] G. Sarton, *Introduction to the History of Science*, Vol. I, pp. 16–17.
[12] A. A. Khairallah, *Outline of Arabic Contributions to Medicine and Allied Sciences*, p. 43.
[13] Cumston, *op. cit.*, p. 191.

wake, and the fanaticism of European conquerors in the south-west of Europe destroyed the largest part of Arabic writings. Fortunately, most of the classics have survived. Many of the books that have come down to us have been distorted and mutilated either by bad copying or by spurious editions. "Repeated copying from copies and alterations and additions inserted by various teachers helped in their distortion so that one rarely sees two copies of the same book that read alike."[14] The manuscripts that have come down to us have not been studied with care and diligence. They require a thorough study before we can arrive at a fair estimate of Muslim contribution to medicine. The Latin translations from Arabic were often careless. Many of the Latin translators claimed as their own what they had only translated. Campbell believes that "the Latin translations failed to convey the true conception of Arabian medicine to the medieval scholastics"[15]; and Browne says that "it must be said once for all that no just idea of Arabian medicine can be derived from the imperfect renderings of standard Arabic books."[16]

B

COLLECTION AND TRANSLATION OF BOOKS

Before proceeding to examine the contribution of different Muslim scholars to medicine, a word might here be put in about the translators who laid the cornerstone of the edifice built by the subsequent authors.

The task of translating from foreign languages, e.g., Greek, Syriac, Pahlawi, etc., into Arabic was more difficult than would appear at first sight; but for the princely patronage and philanthropists' munificence, it might well have been impossible. In this connection the names of al-Manṣūr, Hārūn al-Rashīd, and al-Māmūn in Baghdād, of Zangi in Damascus, of Ṣalāḥ al-Dīn in Cairo and of 'Abd al-Raḥmān III and Ḥakam in Andalusia illuminate the pages of history. Their generosity and fair-mindedness made no distinction between Christians, Jews, Sabaeans, and Muslims. Their boundless bounty and complete lack of bigotry gravitated men of letters to their capitals. But the immensity of the task of translation can be judged from the fact that the vehicle of the new Muslim civilization was the language which had never been used before for any scientific purpose and yet it was in this very language that every bit of knowledge had to be translated for proper assimilation. This necessitated the creation of a philosophic and scientific terminology which did not exist. The collection of manuscripts was carried on by the Muslims at that time with fervid zeal in every corner of the civilized world. Arab conquerors sometimes made the acquisition of manuscripts a part of the peace treaty. Thus, when Hārūn al-Rashīd conquered 'Ammūriyah and Ankara, he collected all the

[14] Khairallah, *op. cit.*, pp. 54ff.
[15] Campbell, *Arabian Medicine*, Vol. I, p. xii.
[16] E. G. Browne, *Arabian Medicine*, p. 113.

manuscripts he could find,[17] and al-Māmūn sent a special mission to the Byzantine Emperor to collect manuscripts.[18] On several occasions books were sent and accepted as appeasing presents.[19]

After collecting all available manuscripts from Greece, Asia Minor, Egypt, Syria, Persia, and India, the Caliphs, princes, and rich men appointed able men to study, edit, and translate the manuscripts, but before translation, several copies were thoroughly studied, compared, and edited. Ibn al-Ash'ath divided each of Galen's books into sentences, paragraphs, chapters, and divisions—a thing that was never done before—in order to facilitate the acquisition and understanding of Galen's teaching.[20]

According to Khairallah, two methods of translation were adopted. The first was that of ibn al-Baṭrīq and 'Abd al-Masīḥ Na'īm al-Ḥimṣi who undertook literal translation. This was obviously unsatisfactory as there were many words which had no Arabic equivalent; besides the whole construction and syntax were different in the different languages. The second method was that of Ḥunain ibn Isḥāq and al-Jauhari, who would read the whole sentence or paragraph, get its meaning or sense, and then put it in proper Arabic.[21] According to al-Nadīm's *Fihrist*, Khālid ibn Yazīd ibn Mu'āwiyah was the first to encourage Greek philosophers in Egypt to translate works on medicine. He died in the beginning of the second/eighth century.

The early translations were made by Christians, Jews, and Sabaeans under the patronage of Muslim rulers. The first man to translate a medical work into Arabic was Māsarjawaih (b. 61/680), a Jewish physician from Baṣrah. But the credit of being the greatest translator of medical works goes to a renowned Nestorian physician of remarkable scholarship, Ḥunain ibn Isḥāq, who died in Baghdād in about 264/877. He was assisted by Isḥāq, his son, Ḥubaish al-A'sam, his nephew, Yaḥya ibn 'Adi, 'Īsa ibn Yaḥya, and others. Other translators of repute were abu Yaḥya ibn al-Baṭrīq (d. c. 191/806), Thābit ibn Qurrah (d. 289/901), a Christian from Ba'labakk. The work of these translators and a host of others covered many subjects besides medicine. This great intellectual activity in due course brought its results, for gradually every large city developed a library which contained reading-rooms, quarters for translators, and meeting-places for scientific discussions. Such were *Bait al-Ḥikmah* (House of Wisdom) in Baghdād and *Dār al-Ḥikmah* (Hall of Wisdom) in Cairo. The library at Cordova had over a quarter of a million volumes. The library of Nūḥ ibn Manṣūr, ruler of Bukhāra, contained books on all subjects together with their indices. Ibn al-Matrān, the famous physician of Ṣalāḥ al-Dīn, had a library of 10,000 manuscripts. Ibn al-Tilmīdh, author of the best known pharmacopoeia of his time, had 20,000 manuscripts

[17] Ya'qūbi, Vol. II, p. 436.
[18] Uṣaibi'ah, Vol. I, p. 187.
[19] *Ibid.*, p. 163.
[20] *Ibid.*, p. 246.
[21] Khairallah, *op. cit.*, p. 41.

in his library. The well-known medical historian al-Qifṭi had a library worth more than 50,000 *dīnārs*. Every large hospital possessed a library of its own.[22]

C

HOSPITALS

The hospital at Jundi-Shāpūr in Persia was the first and foremost to influence the Arabs. Al-Ḥārith ibn Kaladah, a relation of the Prophet practising during his time, was an alumnus of this hospital. Small hospitals for the blind and lepers were built during the Umayyad period, but they were little more than segregation camps. Proper hospitals, however, came to be built during the 'Abbāsid period. Those at Baghdād, Damascus, and Cairo were the best known at the time. Besides the hospitals for the lepers and the blind, there were asylums for the insane and ambulatory clinics to minister to the needs of far-flung places where there were no physicians. Prisons were not forgotten and physicians looked after prisoners since they were considered to be a State charge. First-aid stations were established near mosques where large numbers congregated. The army had its physicians, and field hospitals attached to the armies were carried on camel-back. Female nurses used to serve in the field hospitals.

General hospitals were established not only at Baghdād, Damascus, and Cairo, but also at Mecca, Jerusalem, Aleppo, Ḥarrān, and several cities in Andalusia. Patients in such hospitals were admitted on the sole criterion of their condition without prejudice to colour, creed, sex, or social status. Al-Manṣūr Qalāwūn, the ruler of Egypt, dedicated the hospital erected by him for the benefit of "the king and the subject, the prince and the soldier, the great and the small, the freeman and the slave, for men and for women."[23] Foundations *(auqāf)* were created to support the hospitals and were administered by high dignitaries with the utmost care. Issa writes in his *Histoire des bimaristans a l'epoque Islamique*:[24] "The furniture, bedding, and clothing at the Manṣūri hospital at Cairo, rivalled in their luxury and perfection those that adorned the palaces of the Caliphs and the princes. The nourishment consisted of flesh of fowl and mutton, and each patient was given the quantity of food that the state of his health permitted." Sometimes musicians and singers were brought to hospitals to entertain the sick and convalescing patients. The conditions prevailing in hospitals in those days can best be described in the words of Uṣaibi'ah:[25] "Abu al-Ḥakam, the dean of the Nūri hospital of Damascus, used to make the rounds of patients every morning, find out their condition and consider

[22] *Ibid.*, p. 40.

[23] Maqrīzi, Vol. II, p. 406.

[24] Issa, *Histoire des bimaristans a l'epoque Islamique*, p. 20; Khairallah and Haddad, "A Study of Arab Hospitals in the Light of Present-Day Standardization," *Bull. Amer. Coll. Surg.* Sept., 1936; Khairallah, *op. cit.*, p. 63.

[25] Usaibi'ah, Vol. II, p. 153.

their affairs. With him were his assistants and orderlies and all that he wrote down as orders for the patients regarding medicine and diet were carried out on time and without delay. After finishing his rounds he used to go to the citadel and treat whoever was sick among the nobility and government officials. He would then come back to the hospital and sit in the large auditorium, read his books, and prepare his lectures. Nūr al-Dīn had installed in the hospital a large library with a collection of books and manuscripts placed in bookcases in the main hall. Several physicians and students used to come and sit at his feet. He taught the students and discussed medical topics and interesting cases with the physicians." Uṣaibi'ah continues: "Patients were examined in an outside hall and those who did not need hospital treatment were given prescriptions which were prepared at the hospital pharmacy. Those who needed hospital treatment were registered and admitted. They were given a bath and made to put on clean hospital clothes, their own clothes being taken away and stored. They were kept at the hospital until completely cured. On their discharge from the hospital they were given a suit of clothes and some money to defray immediate and necessary expenses outside the hospital until they were able to work." Uṣaibi'ah proceeds: "A pharmacy under a competent and registered pharmacist was attached to every large hospital. It was well stocked with syrups, all sorts of drugs and drug preparations, fancy porcelain, and rarities. Pharmacists were licensed and registered and in each large town an inspector kept constant watch over pharmaceutical preparations and chemical products.

"Attached to large hospitals were medical schools where students gathered in the main hall and reviewed their studies and copied medical manuscripts which were compared and corrected by the teachers. The teachers lectured to them from the books of Galen and later from al-Rāzi and al-Majūsi until the advent of ibn Sīnā's *Canon* which eclipsed them all."[26]

Several books were written on hospitals and hospital management. Unfortunately, most of them have been lost. Al-Rāzi wrote a book on *Ṣifat al-Bīmāristān* and Zāhid al-'Ulamā' wrote *Kitāb al-Bīmāristān*. The first regular hospital was built by Hārūn al-Rashīd in Baghdād in 170/786, but a bigger and more up-to-date hospital was founded in 368–369/978–979 by 'Aḍud al-Daulah. In Damascus there was the al-Nūri, built by Nūr al-Dīn Zangi; one was built by Ṣalāḥ al-Dīn at Jerusalem and another at Cairo. Qalāwūn built the al-Manṣūri at Cairo. Besides these there were hospitals in Mecca, Medina, Ḥarrān, and other notable towns. In Andalusia there were over fifty hospitals in Cordova alone, besides those at Granada, Seville, and Toledo.

It will be seen from a brief description of the conditions obtaining at the time in hospitals that in many respects they were better than those prevailing even today. The Arabs may not have been the first to build hospitals but they were certainly the first to improve upon them. They started to give

[26] *Ibid.*, p. 243; Khairallah, *op. cit.*, p. 65.

regular instruction in hospitals and to have out-patient departments. They were the first to have regular inspection over the administration and finances of the hospitals, the first to examine and license physicians, and the first to have regular pharmacies attached to hospitals. They went further by examining and licensing a physician for the practice of a speciality. The interest of Muslims in building hospitals was not limited to the Arab period; it continued throughout the ages.

D

PHYSICIANS AND SURGEONS

Let us now come to the most important part of our narrative, namely, the great authors and practitioners of the medical science whose theory and practice enlightened the path of scientific research and whose fame is indelibly imprinted on the pages of history. Here again, needless to say, we shall have to confine ourselves to the selection of a few of these geniuses.

The first great name amongst Muslim physicians is that of abu Bakr Zakarīya al-Rāzi. He was a prolific writer and is said to have written no less than 117 books dealing with all the different branches of medicine. Of al-Rāzī's works, *al-Ḥāwi* (Continens), running into twenty volumes, is undoubtedly the most important. This work was translated into Latin by Faraj bin Sālim in 678/1279 and printed at Brescia nearly two centuries later. Al-Rāzi did not actually write this book; he left notes on his original observations, extracts from other peoples' works, and clinical notes of his medical experience. All this material was sold by his sister to ibn al-'Amīd, the vizier of Rukn al-Daulah, who got the drafts of those rough notes properly arranged in book-form by the noted physicians of his time including al-Rāzī's own pupils. 'Ali ibn 'Abbās (Haly Abbas) was of the view that during his time only two copies of the book were in existence. He regarded *al-Ḥāwi* the repository of medical knowledge concerning hygiene, diseases, their symptoms, and treatment with medicine and diet, al-Rāzi's sources being Hippocrates, Galen, and all the physicians that preceded him. E. G. Browne translated some of its clinical notes into English and Max Meyerhof published the text and translation of some more.

Relatively speaking, the most important of al-Rāzī's minor treatises is *Kitāb al-Judari w-al-Ḥaṣbah*. It deals with smallpox and measles. It was translated into Greek and Latin and printed in several European countries. This work is particularly significant because it is the first to give a clear description of smallpox as a disease and also the first to give a symptomatic distinction between smallpox and measles. Al-Rāzi was the first to include in the pharmacopoeia the white-lead ointment, later on known in the Middle Ages in Europe as *Album Rhases*, and the first to use mercury as a purgative. He was also the first to use "animal gut as a ligature for surgical operations and was the first to recognize the reaction of the pupil to light."[27]

[27] Cyril Elgood, *A Medical History of Persia*, p. 203.

The next great physician was 'Ali ibn al-'Abbas al-Majūsi known in the West as Haly Abbas. Either he himself or his father was originally a Zoroastrian; hence the name al-Majūsi. He was a Persian by birth and flourished during the period of 'Aḍud al-Daulah and died in 384/994. After al-Rāzi and ibn Sīna his is the greatest name in the Caliphate of Baghdād. His most famous work is the medical encyclopedia called the *Kitāb al-Māliki* (Liber Regius). Sarton regards this work as more systematic and concise than al-Rāzī's *al-Ḥāwi* and more practical than ibn Sīnā's *Qānūn* by which it was superseded. Half of the book deals with the theory and half with the practice of medicine. Most important parts of it relate to dietetics and materia medica. He made some original clinical observations and was the first to give close description of the capillary circulation long before Harvey. He says that during relaxation (diastole) the pulsating vessels (arteries) that are near the heart draw air and thinned blood from the heart by suction, because during their contraction (systole) the arteries empty themselves of blood and air, so that when they relax, air and blood is sucked to them to fill them. Those that are near the skin draw air from outside. Those that are in the middle, between the heart and the skin, have the property of drawing the thinnest blood from the non-pulsating vessels (veins). That is because the veins have pores communicating with the arteries. The proof of this is that if an artery is cut, all the blood that is in the vein is emptied through the cut. He was also the first to give proof of the motion of the womb during parturition and to show that child does not come out by itself, but it is the movement of the womb that pushes it out.[28] In al-Qifṭī's words *al-Māliki* was the splendid work and the noble treasure of the theory and practice of medicine admirably arranged. It had been one of the most popular texts on medicine until it was replaced by ibn Sīnā's *Qānūn*.

Al-Majūsi gives a remarkably well-worded advice to the physicians. He says that the patient should be treated if possible with diet, not with drugs. If he can be treated with simple drugs he should not be administered compound ones, nor indeed strange or unknown ones. With regard to the relation between the physician, the patient, and the disease, he says that they are three. If the patient co-operates with the physician they would become two against one and would be able to beat the disease, but if he does not listen to the physician nor follow his direction, he and the disease would be two against one, i.e., the physician; one can hardly beat two. He states that all physicians agree that the preservation of health is more important than the cure of disease and quotes Hippocrates that the curing force of disease is nature itself.[29]

Al-Majūsi's surgical technique is no less remarkable. His lucid description of the surgical operation for the removal of tubercular glands is a fine specimen of his art. He says: "Cut the skin longitudinally down to the gland. Retract

[28] P. K. Hitti, *History of the Arabs*, p. 365.
[29] Khairallah, *op. cit.*, p. 28.

the skin with hooks. Dissect slowly and gently, freeing the gland from the tissues around it. Take care not to cut any vessel or puncture any nerve. If a vessel is cut, ligate it, lest the haemorrhage obscure the field and prevent you from carrying out a proper and thorough operation." After removal of the gland, put your finger in to feel for any small glands that might be left. If there are any, remove them too. When all the glands are removed, suture the incision.

Al-Majūsi recognized the gravity of cancer and says that medicines do not help in curing the disease. He advises removal of the whole area affected by cutting at a distance from the growth so that none of its roots are left. He advises that after removal blood should not be stopped from running but that the surgeon should see that the diseased blood is drained off.[30]

The famous physician who succeeded 'Ali ibn 'Abbās in the Muslim world was abu al-Qāsim Khalaf ibn 'Abbās al-Zahrāwi (d. 404/1013). He took his name from his birthplace al-Zahrā', the famous suburb of Cordova. He was Court physician to the Caliph al-Ḥakam II. His fame chiefly rests on surgery for he was admittedly the greatest of all Muslim surgeons. He wrote one of the biggest medical encyclopedias, *al-Taṣrīf*, in thirty sections. One of the topics discussed in this work is the preparation of medicines by sublimation and distillation. Its most important part is, however, surgical wherein he "introduces and emphasizes such new ideas as cauterization of wounds, crushing stone inside the bladder, and the necessity of vivisection and dissection."[31] He also deals with obstetrics and the surgery of eyes, ears, and teeth and gives a description of surgical instruments.

The surgical part of *al-Taṣrīf* was translated into Latin by Gerard of Cremona, and various editions of it were published at Venice, Basel, and Oxford from the ninth/fifteenth to the twelfth/eighteenth century. For centuries it was used as a text-book in surgery in the universities of Europe such as Salerno, Montpellier, and other schools of medicine.[32]

The man who is described by one Orientalist as "the most famous scientist of Islam and one of the most famous of all races, places and times" and by the other "the greatest man that this world has ever seen"[33] is abu 'Ali al-Ḥusain ibn 'Abd Allah ibn Sīna. William Harvey puts him in the same category as Aristotle and Cicero. At the age of eighteen he cured the Sāmānid Amīr of Bukhāra and as a result was appointed Court physician and given permission to use the royal library.

Ibn Sīnā's greatest medical work was the *Qānūn* (Canon) used as "medical Bible for a longer period than any other book,"[34] an encyclopedic work of about a million words covering the entire medical knowledge, ancient as well

[30] Al-Majūsi, *Kitāb al-Māliki*, Vol. II, p. 467, see Khairallah, *op. cit.*, p. 118.
[31] P. K. Hitti, *op. cit.*, p. 577.
[32] *Ibid.*
[33] G. Sarton, *op. cit.*, Vol. I, p. 709.
[34] Sir W. Osler, *Evolution of Modern Medicine*, 1922, p. 98.

as contemporary. In many ways he resembled Galen. Before ibn Sīnā's *Qānūn*, the best work on medicine was al-Rāzī's *al-Ḥāwi* but, according to all competent authorities, that work was superseded by the *Qānūn*. Ibn Sīna analysed for the first time pathological and psychological phenomena and made acute observations about the differential diagnosis of medastinitis and pleurisy, infectious nature of phthisis, skin diseases, sexual ailments and perversions (including love-sickness), diseases of the nervous system, and transmission of diseases through water, food, and soil.

Ibn Sīna is the first to write a careful description of meningitis and differentiate between primary and secondary meningismus. He also gives a full description of the various types of diseases which cause jaundice. He differentiates between facial paralysis of central origin and that of local origin. He describes apoplexy as being caused by plethora. He gives a clear description of the symptoms of pleurisy and its differential diagnosis. The signs of pleurisy, he says, are: continuous fever; stitch in the side which many times does not appear except after a deep breath; shortness of breath; see-saw pulse; and cough, usually dry in the beginning, but may be wet and with expectoration from the start. He says: Inasmuch as pleurisy might resemble hepatitis and pneumonia, we must differentiate between them. The difference between pleurisy and hepatitis is that in the latter the pulse is wavy, the pain is dull and heavy and not pricking, the face is yellowish, the urine thick and the stools "livery." There is heaviness in the right side over the liver region and no stitch in the side. The difference between pleurisy and pneumonia is that in the latter the pulse is wavy, the shortness of breath more marked, the breath hotter besides other symptoms.[35]

The *Qānūn* is divided into five major sections. Briefly stated, the contents of these sections are as follows. The first section deals with definitions, elements, humours, temperaments, and spirits; anatomy (bones, muscles, nerves, arteries, and veins); diseases, their causes and symptoms; hygiene and prophylaxis; and general treatment. The second section deals with simples, in an alphabetical order. The third section gives a description of diseases from the head downwards, including the anatomy of the organs—head, brain, nerves, eyes, ears, nose and mouth; tongue, teeth, lips and gums; throat, chest, and lungs; heart, breast, oesophagus and stomach, liver, and gall-bladder; spleen, intestines, male and female genital organs—and general diseases. The fourth section deals with fever, prognosis and crisis; swellings and ulcers, surgery, fractures and dislocations, poisons, skin diseases, and cosmetics. The fifth section deals with compound drugs and therapeutics.

Several commentaries on the *Qānūn* are extant, the best known being by ibn Nafīs under the title *al-Mu'jiz*. In the Asian part of the Muslim world, the *Qānūn* held the sway, but in Spain it was played down by ibn Zuhr and ibn Rushd. It was translated into Latin by Gerard of Cremona.[36]

[35] Ibn Sīna, *al-Qānūn fi al-Ṭibb*, Vol. II, pp. 240–41.
[36] Khairallah, *op. cit.*, pp. 124–25.

Another unique book by ibn Sīna is the *Urjuzah fi al-Ṭibb*, which is a medical poem that sums up the medical knowledge of the time. It was meant to facilitate the study of medicine. With their wonderfully tenacious memories the Arabs were able to memorize it. Its first part deals with the theory of medicine and hygiene, and the second with treatment. Another of his well-known books is *al-Shifā'*. Uṣaibi'ah credits him with having written nineteen medical and ninety non-medical books.[37]

The illustrious "Shaikh," by which name ibn Sīna is generally known throughout the Muslim world, died at Hamdān in 428/1037. He reigned supreme for more than six centuries not only in the Muslim world but also in Christendom. His theories, as propounded in the *Qānūn*, are still widely respected in the Orient by Ḥakīms and form the cornerstone of the history of medical teaching in the Occident.

In Egypt flourished ibn al-Haitham (Alhazen of the West), "the greatest Muslim physicist and one of the greatest students of optics of all times."[38] He was born in Baṣrah but migrated to Egypt in the time of Caliph al-Ḥākim. "He was also an astronomer, mathematician, physician, and he wrote commentaries on Galen and Aristotle." He corrected the Greek misconception about the nature of vision and taught, for the first time, that light does not "exude" from the eye but enters it. He also taught that the retina was the seat of vision and that the impressions made upon it were conveyed along the optic nerve to the brain forming visual images on symmetrical portions of both retinas.

In Spain there was a most famous family of physicians whose contribution to medicine was no less remarkable. Translations from the works of this family are found in the libraries of Western universities even to the present day. We are referring to the ibn Zuhr family that drew its name from their ancestor Zuhr. The first great physician of the family was abu Marwān 'Abd al-Malik (d. 470/1077–78). He was renowned as a diagnostician. His son abu al-'Alā' (d. 525/1130–31) was even a greater physician than him. He was first attached to the Court of Seville but was later raised to the rank of a vizier when that kingdom was conquered by Yūsuf ibn Tāshifīn. He wrote several medical works, viz., *Kitāb al-Khwāṣṣ* (Book of Properties), *Kitāb al-Adwiyah al-Mufradah* (Book of Simple Drugs), *Kitāb al-Īḍāḥ* (Book of Explanation), *Mujarrabāt* (Personally Tested Prescriptions), *Kitāb Ḥall Shukūk al-Rāzi 'ala Kutub Jālīnūs* (Resolution of al-Rāzī's Doubts regarding Galen's Works), *Kitāb al-Nukāt al-Ṭibbīyyah* (Book on Principles of Medicine). The last mentioned work among other things specially deals with climatological and anthropological conditions prevailing in Marrakush and with deontological guidance. He also wrote a treatise in refutation of certain points in ibn Sīnā's work on simple drugs.

[37] *Ibid.*
[38] G. Sarton, *op. cit.*, Vol. I, p. 721.

The most illustrious member of this family was abu Marwān 'Abd al-Malik ibn abi al-'Alā' Zuhr (d. 556–557/1160–1161) known in Latin works as Avenzor. His supremacy as a physician was acknowledged not only in the Muslim world but also in Christendom. His medical theory had strong empirical tendencies. He may justly be said to be the greatest clinician of Islam after al-Rāzi. Only three of his at least six works are now extant.

1. *Kitāb al-Taisīr fi al-Mudāwāt w-al-Tadbīr* (Book of Simplification on Therapeutics and Diet), written at the request of ibn Rushd, is the most important of them all. It deals elaborately with pathology and therapeutics and at the end gives a comprehensive collection of recipes. In this work ibn Zuhr makes acute clinical observations about mediastinal tumours, intestinal phthisis, pericarditis, scabies, pharyngeal paralysis, and inflammation of the middle ear.
2. *Kitāb al-Aghdhiyah* (Book on Eatables).
3. *Kitāb al-Iqtiṣād* dealing with therapeutics, psychotherapy, and hygiene.

Ibn Zuhr is said to be the first physician to have described the itch-mite. He advocated artificial feeding through the gullet and rectum.

Ibn Zuhr's son abu Bakr Muḥammad ibn al-Mālik was a successful physician and his daughter and the daughter of that daughter were capable midwives. Medicine went into the family down to six generations. Ibn Zuhr's influence through Hebrew and Latin translations upon Western medicine lasted till the end of the eleventh/seventeenth century. The translations of *Taisīr* like ibn Rushd's *Kulliyāt* saw several editions.

The great Spanish philosopher ibn Rushd (Averroës) was a contemporary of ibn Zuhr. His greatness as a physician was eclipsed only by his greatness as a philosopher. His most important medical work *Kitāb al-Kulliyāt fi al-Ṭibb* (Latin *Colliget*) was a veritable encyclopedia of medicine. As mentioned above, the Latin translation of this work went through several editions in Europe. It was also translated twice in Hebrew. It had seven parts (books) dealing with anatomy, physiology, pathology, diagnostics, materia medica, hygiene, and therapeutics. He was the first to discover that no person can get smallpox more than once. He is also said to be the first to understand the working of the retina.

Ibn Ṭufail, ibn Rushd's predecessor in philosophy, was also a renowned physician; he wrote two books on medicine, neither of which is extant.

Another name worth mentioning in connection with the development of medicine in the Muslim West is that of ibn Baiṭār. He was born in Malaga and travelled all over Spain, North Africa, Egypt, Syria, and Asia Minor. He was a botanist rather than a pharmacologist. Most of his work was done in Egypt where he was appointed chief inspector of pharmacies. His two chief works, *al-Mughni fi al-Adwiyah al-Mufradah* and *al-Jāmi' li Mufradat al-Adwiyah w-al-Aghdhiyah*, embodied all the Greek and Arabic literature on botany and materia medica as well as the author's own wide experience and research. He describes more than one thousand and four hundred drugs from

the vegetable, animal, and mineral kingdoms, three hundred of which are novelties. The book is arranged alphabetically. Uṣaibi'ah[39] describes the thoroughness of his teacher's methods; Uṣaibi'ah was not only al-Baiṭār's pupil but also herborized with him in Syria. His book *al-Adwiyah al-Mufradah* was translated into Latin, *Simplicibus*, printed in twenty-six editions during and after the ninth/fifteenth century, and was used in the formation of the first London pharmacopoeia issued by the College of Physicians during the reign of James I. Some parts of its Latin version were printed as late as 1172/1758 at Cremona.[40]

'Alā' al-Dīn abu al-Ḥasan 'Ali ibn abi al-Ḥazm, better known as ibn al-Nafīs, flourished during the first half of the seventh/thirteenth century. Born in Damascus, he spent most of his life in Cairo where he practised medicine and became dean of the Manṣūri hospital. He wrote several books, the most important being *al-Mu'jiz* and *Sharḥ Tashrīḥ al-Qānūn*. In describing the anatomy of the pulmonary vessels, ibn Nafīs also described for the first time the pulmonary circulation and declared three centuries before Servetus that blood is aerated in the lungs. In his description of the anatomy of the heart he gives the nearest description in those times of the coronary circulation. He says that ibn Sīnā's statement that the blood which is in the right side of the heart is to nourish the heart is not true at all, because the nourishment of the heart is from the blood that goes into the vessels that permeate the body of the heart.[41]

In this section we have briefly touched upon the works of the great authors who have contributed so largely to the development of the various branches of the medical science. There are a host of others who played an equally important role. They live in history. We have also been unable to deal with the veterinary science, especially hippology, of which the Arabs were so fond and in which they displayed so great a mastery.

Arab biblio-biographers, like al-Qifṭi, ibn abi Uṣaibi'ah, and ibn Khallikān, have done a magnificent job in collecting the works of various authors, but it is a fact that scores and scores of manuscripts are still lying unexplored in libraries and mosques, palaces and museums and are awaiting careful examination; these may open fresh sluice-gates of knowledge regarding Muslim contribution to medical and other sciences. The need for more texts and more translations, more especially of those works which were composed after the Mongol hordes broke in upon Persia and Baghdād, is very great indeed for the present renaissance of the Muslim world. The task is not easy; in fact, it is superhuman.

[39] Uṣaibi'ah, Vol. II, p. 133; cf. Khairallah, *op. cit.*, p. 154, also P. K. Hitti, *op. cit.*, p. 576.

[40] M. M. Sharif, *Muslim Thought, Its Origin and Achievements*, p. 63.

[41] Cf. Khairallah, *op. cit.*, pp. 129–30.

E

INFLUENCE

Muslim physicians, more particularly some of those who lived in Spain, contributed largely to the Renaissance in Europe. But in the matter of Muslim influence upon European medicine no names are greater than those of al-Rāzi and ibn Sīna. Within a century and a half of the death of ibn Sīna his works reached Spain and Sicily where they began to be translated. It was from these centres of learning that Arab science spread to the other parts of Europe. The spread of Arab science in the West was mainly due to the fact that the Eastern Caliphs were in constant touch with the rulers of Europe. Hārūn al-Rashīd sent an ambassador to the Court of the Roman Emperor. It is even said that Charlemagne came to Palestine incognito in order to consult the Arab physicians about his health. The medical scholars of the universities of Western Europe like Montpellier and Bologna particularly specialized in Arab learning and were responsible for the propagation of the teachings of al-Rāzi and ibn Sīna. Montpellier had an immense library. All the translations made by Constantine the African and Gerard of Cremona were housed in this library at a time when the Paris University library hardly contained more than a score of medical works. From these centres the teachings of the Arabs spread to all medical schools in Europe. From the sixth/twelfth to the eleventh/seventeenth century al-Rāzi and ibn Sīna were considered superior even to Hippocrates and Galen.[42]

[42] C. Elgood, *op. cit.*, pp. 205ff.

BIBLIOGRAPHY

Ibn abi Uṣaibi'ah, *'Uyūn al-Anbā' fi Ṭabaqāt al-Aṭibbā'*, Wahābiyyah Press, Cairo, 1300/1882; al-Qifṭi, *Tārikh al-Ḥukamā'*, Sa'ādah Press, Cairo, 1326/1908; ibn al-Nadīm, *al-Fihrist*, Raḥmāniyyah Press, Cairo, 1348/1929; Sir Thomas Arnold and A. Gillaume (Eds.), *The Legacy of Islam*, London, 1942; Edward G. Browne, *Arabian Medicine*, Cambridge University Press, 1921; A. Castiglioni, *A History of Medicine*, 2nd ed. rev. & enlarged, trans. from the Italian by E. B. Krumhaar, New York, 1947; L. Clendening, *A Source-Book of Medical History*, New York, 1942; E. G. Coppola, "The Discovery of the Pulmonary Circulation: A New Approach," *Bull. Hist. Med.*, Jan.–Feb. 1957, Vol. XXXI, No. 1, pp. 44–47; Charles G. Cumston, *An Introduction to the History of Medicine*, Kegan Paul, Trench, Trubner & Co., London, 1926; Omar A. Farrukh, *Arab Genius in Science and Philosophy*, 2nd ed., trans. by J. B. Hardie, Washington, 1934; A. R. Ghani, "Medieval Muslim Science: A Handlist of Indo-Pakistani References," *Pakistan J. Sci.*, 1954, Vol. VI, No. 1, pp. 49-53; B. L. Gordon, "Arabian Medicine in the Post-Koranic Period," *J. Michigan State Med. Soc.*, Sept. 1956, Vol. LX, No. 9, pp. 1109–16; C. H. Haskins, *Studies in the History of Medieval Science*, Cambridge, Mass., 1924; P. K. Hitti, *History of the Arabs*, Macmillan, London, 1937; ibn Jubair, *Riḥlah Ibn Jubair* (The Travels of Ibn Jubair), Sa'ādah Press, Cairo,

1326/1908; Dr. Issa, *Histoire des bimaristans a l'epoque Islamique*, Cairo; Amin A. Khairallah, *Outline of Arabic Contributions to Medicine and Allied Sciences*, American Press, Beirut, 1946; Lucien Leclerc, *Histoire de la medicine arabe*, 2 Vols., Leroux, Paris, 1876; M. Meyerhof, "Sultan Saladin's Physician (Ibn Jami) on Transmission of Greek Medicine to Arabs," *Bull. Hist. Med.*, Vol. XVIII, July 1945, pp. 169–87; Aldo Mieli, *La science Arabe et son role dans l'evolution scientifique mondiale*, Brill, Leiden, 1938; De Lacy O'Leary, *How Greek Science Passed to the Arabs*, London, 1951; Osler, *Evolution of Modern Medicine*, Yale University Press, 1921; G. Sarton, *Introduction to the History of Science*, 3 Vols., Baltimore, 1927–48; Sayyid 'Ali Aḥmad Nayyar Wāsṭi, *Ṭibb al-'Arab* (Urdu translation of E. G. Browne, *Arabian Medicine*, with explanatory notes and comments), Lahore, 1954; W. Winwood Reade, *The Martyrdom of Man*, Walts & Co., London, 1872; ibn Sīna, *al-Qānūn fi al-Ṭibb*, 3 Vols., Cairo; al-Rāzi, *Kitāb al-Ḥāwi fi al-Ṭibb*, Parts I, II, III and IV in Arabic, Osmania Oriental Publication Bureau, Hyderabad Deccan, 1374–76/1955–57.