# Glimpses into the History of Arabic Medicine*

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"And for every nation there is an appointed time, so when their appointed time is come, they shall not remain behind the least while, nor shall they go before." KORAN (Al-a'ra'f) Chap. VII, p. 32.

RATIONAL medicine had its beginning with the Greeks after its transition through Mesopotamian, Egyptian, Hindu, and Chinese channels, but it did not come into its own until it fell into the hands of Hippocrates. It was under the illustrious son of the priest of the Aesculapian temple at Cos and his disciples that medicine laid aside its theurgic and superstitious mantle and began to lay a classical and sound foundation built on observation and experiment.

This Hellenic mantle was to be further trimmed by the Hellenistic school at Alexandria. Herophilus, Erasistratus, and, later, Galen and others of the school did much of this work. The miraculous feature of their work is its altrustic nature. Contrast with that the stress that the Romans of a later day laid upon material interests in their pursuit and practice of medicine, thus eclipsing in their efforts the purely scientific spirit of the earlier Greeks.

Following the decline of the Roman civilization, the Latin West broke away from Greek science and the hiatus was further widened by the triumph of the Church and the feudal system. Thus, from the fifth to the latter part of the ninth centuries, monastic medicine and faith healing held sway in Latin Europe.

But while Western Europe was led astray in the darkest period of civilization, content in contemplation of celestial rewards and of "soul salvation", Islam was established, the result of the spiritual genius of one man. Muhammad (571–632 A.D.) consolidated many Arab tribes into a compact nation which in less than a hundred years became an empire that reached from the Atlantic to the Indus. This same period saw a great upsurge in dissemination of learning and culture, fostered by a rare spirit of tolerance.

By the time the Arabs had completed the invasion of Egypt and Persia (637 A.D.), Greek science had lost its originality as exemplified by the Alexandrian school in Egypt. From the third century onward, Syria had adopted the

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CHRONOLOGICAL DATA OF THE ARABIAN DYNASTIES
Pre-Islamic and Islamic

| Name | Date | Capital |
|---|---|---|
| Pre-Islamic | | |
| Sabaean | 800–115 B.C. | Sirwah & Ma'Rib |
| Kalabean | ? | Not Known |
| Minaean | ? | Not Known |
| Himyarites | 115 B.C.–250 A.D. | Ma'Rib |
| Nabatean | 200 B.C.–250 A.D. | Palmayra |
| Islamic | | |
| Mohamed & the Four Caliphs | 630–656 A.D. | Medina |
| Umayyad | 661–750 A.D. | Damascus |
| Abassid | 750–850 A.D. | Baghdad |
| Umayyad of the West | 711–1492 A.D. | Cordova, Spain |
| Fatimites | 969–1171 A.D. | Cairo, Egypt |
| Ayoubean | 1171–1250 A.D. | Cairo, Egypt |
| Mamelukes | 1250–1517 A.D. | Cairo, Egypt |

FIG. 1

Aramaic civilization which in turn had been influenced by Greek culture. 'Irāq, meanwhile, was characteristically Persian and Indian in thought. The Arabs brought with them their very adaptable language which was destined to become the lingua franca of science and the medium of expression for half of the then known world. This, along with their avaricious appetite for learning, enabled them to assimilate in a few years what had taken the Greeks centuries to develop.

Of all the ancient cultures that influenced the Muslim Arab, Egyptian, Babylonian, Phoenician, and Judean, the Hellenistic was the most important. The perpetuators of the Syrio-Hellenistic civilization were mainly the Nestorians and Jacobites, who were among the new Arab subjects. The chief Nestorian scientific center in the middle of the sixth century was Jundi-Shāpūr, where there was an academy with a medical school and a large hospital, founded in southwest Persia, about the year 555 A.D. by a Sassanian king, Chosroes Nūshīrwān. In this center many Greek, Hindu, and Persian writings were translated into Aramaic (Syriac), the language of instruction. This academy, under the Arabs, continued as a scientific center of the new Islamic empire.

The Arabs were careful not to destroy these centers of learning. It is to the credit of these nomads that they recognized the full value of such centers to their infant civilization. Encouragement and protection were extended. Physicians from the academies, mostly Christians and Jews bearing Arabic names, were invited to posts of honor and leadership. For example, Jūrjīs Bakhtīshū (A.D. 771), the dean of Jundi-Shāpūr, was appointed court physician to the Caliph al-Mansur (A.D. 754–775). The son of Bakhtīshū was appointed chief physician to the newly established Baghdād hospital by Hārūn-ar-Rashīd (A.D. 801).

## Period of Translation and Assimilation (A.D. 750–850)

Until 800 A.D., translations into Syriac and Arabic were sporadic. In 830 Caliph al-Ma'mūn established in Baghdād his famous school of translators, Bayt-al-Hikmāh, i.e. House of Wisdom. In this academy a host of Nestorian scholars of the Persian school of Jundi-Shāpūr began the translations from Greek into Syriac and Arabic of the outstanding scientific works of Greece, India, and Persia.

One of the most illustrious translators of this school was Hunayn ibn Is-Hāq Al-'Ibādī (Johannitius, A.D. 809–877), physician, philosopher, author, and translator. He stands preeminently as the dominating figure at the beginning of the evolution of Arabic medicine. Hunayn was born in Hira ('Iraq), but spent his early youth in Baṣrah. His foundation in Arabic was provided by the teacher, al-Kahlil ibn Ahmed, the founder and author of Arabian prosody. Hunayn also studied at the Jundi-Shāpūr school under the famous physician Yūḥanna ibn-Māsawayh. He had good command of four languages, Persian, Greek, Arabic, and his mother tongue, Syriac. He was appointed superintendent of the academy, Bayt-al-Hikmāh, during Caliph al-Ma'mūn's reign and was chief of staff of all translators.

To evaluate briefly the importance of Hunayn's role as a transmitter of knowledge, it is important to know that Arabic scientific knowledge, until Hunayn's time, was not only meager in content but also lacked the terminology which is so essential for the transmission of thought. Although the translation of Greek knowledge into Syriac began about the first half of the sixth century, most of the translations had been of inferior quality. Activity in translating Greek thought into Arabic began the latter part of the eighth or the beginning of the ninth centuries, and reached its height with Hunayn. The importance of Hunayn's work lies in its polymathic nature. His translations of Plato, Aristotle, Hippocrates, Galen, and others had acquainted him not only with medicine, but also with logic, physics, metaphysics, rhetoric, history, agriculture, theology, and mathematics.

When the work of Hunayn's nephew Hubaysh and also that of his son Is-Haq were added to Hunayn's, there was not a great deal of contemporary knowledge remaining unrepresented in the Arabic language. Hunayn was in a position to develop Arabic terminology for practically every branch of knowledge then in existence.

## The Age of Original Contribution (900–1100 A.D.)

Following the age of translation, the Arabs began to acquire a firm scientific foundation and were relying upon their own inner resources. Among the prominent Muslim physicians who produced imposing original works only three examples will be mentioned here, Al-Razi (Rhazes, 865–925 A.D.), ibn Sina (Avicenna, 980–1037 A.D.), and ibn al-Haitham (Alhazen, 965–1039 A.D.),

all of whom were instrumental in immortalizing the period as the "Golden Age". This study will give only a brief resume of the work of these three physicians showing their influence not only on medicine but on the many subjects in which they excelled.

AL-RAZI, the first and surely the greatest and most original of all the Muslim physicians, was one of the most prolific as an author. The exact date of Abu-Bakr Muhammad ibn Zakariyya Al-Razi's birth is not known but it is believed to have occurred in the second half of the ninth century at Ray of Iran (Persia). The date of his death is generally accepted as 320 A.H. which corresponds to 932 A.D. Hence we have passed his millennium. In his early life he was a student of music, a physicist, and an alchemist. Not until the age of forty did he undertake the study of medicine. His decision to do so was the result of his frequent visits to the hospital of Adudu'd-Dawla and his contact there with the aged dean of pharmacists whom he questioned ceaselessly about medical curiosities. His tutor in the healing art was Ali-ibn-Rabban of Tabaristan whose book, *Firdaws al-Hikmat* (*Paradise of Wisdom*), a treatise on medicine and philosophy, was used as a text by al-Razi. Al-Razi then applied himself to the study of medicine and philosophy, reading the works of Galen and Hippocrates and also acquainting himself with Hindu authors. His knowledge of physics and chemistry was a great asset to him. For a while he was made physician-in-chief to the hospital in his native city, Ray.

*Al-Hawi* (*Continens*), the work of Al-Razi that heads the list, excels all previous Arabic medical literature. It was not only Al-Razi's most extensive work, but in it his originality in the diagnosis and treatment of diseases struck a new note in contrast to the previous work of Arabic physicians which consisted mostly of translations from Greek authors. His style, however, lacked clarity, and his method of classification was imperfect. The book embodied his clinical notes which were evidently meant only for his own use. Absorbed in his clinic, he probably left the compilation of these notes and remarks to some of his students. So far as we know no complete Arabic manuscript of the *Continens* is extant. It is found only in parts today in several European libraries, six volumes, for instance, treasured by the British Museum and the Bodlein Library, and hardly accessible beyond the walls of these institutions. The *Continens* was translated into Latin, first published in 1486 A.D., and later was given many other Latin renditions. Authorities differ widely on the number of books which it contained. Some of the Latin writers claim that it consists of 25 volumes, some 30 and some 37. Arabian authors, however, agree on 12.

Al-Razi's most original work *Kitab-al Jadari Wal-Hasba* (*Treatise on Smallpox and Measles*) is conceded by most historians of medicine to be the first monograph written on the subject. Al-Razi, however, with the scientific honesty and the integrity of a true teacher, gave Galen credit for mentioning smallpox in many of his works. He says "Any physician who claims that the good Galen

did not mention smallpox and that he was unaware of it is undoubtedly mistaken. Such a person probably has either not read Galen's work at all, or if he has read it his reading was very careless."[1]

Al-Razi's monograph is divided into fourteen chapters. His reason for compiling it is stated in the preface:

"It was at an evening in a home of a virtuous man who happened to be a prominent patron of the dissemination of useful science that smallpox was mentioned. I discoursed on the subject as far as my recollection permitted me that evening. My good friend, may Allah prolong his life, entreated me to compile an exhaustive and elaborate treatise on smallpox, for he failed to find anything written on the subject until that time, either modern or ancient. So I have written this treatise in the hope of gaining the favor and the reward of the Almighty."[2]

This preface is interesting because it throws a sidelight on Al-Razi's social position and indicates in what great esteem learning was held by the gentry with whom he associated.

In describing the symptoms of smallpox he stressed the acute fever, severe pain in the back, terror in sleep, restlessness, dryness of skin, sense of heaviness and weight in the head, itching and burning all over the body, and the eruption which follows. He distinguished between the discrete and the confluent type, making a differential diagnosis between measles and smallpox, the latter being usually accompanied by a cough and itching of the nose and ears.

The cases with good prognosis he designated as those with freedom of respiration, clear mentality, and a good pulse. The cases with bad prognosis he designated as those in which the respiration is fast, the patient is restless, the smallpox pustules are dense and confluent with ulceration. He also spoke of the occurrence of gangrene:

"When towards the end of the disease the patient is taken by a very severe pain in the leg or hand or other extremities and pustules turn green or black in color and the patient grows weaker and the pain becomes intense, or the limb is deeply colored, then death is inevitable. But if the patient grows stronger he will recover but the limb will mortify."[3]

In his treatment of the disease he emphasized the importance of cold fluid administration, fresh air, fruit juices of acid and astringent plants like pomegranate. "Let their food be such as to cool the fever like soup of lentils, broth mixed with the juice of unripe grapes, acid minced meat, etc. Let them drink water cooled with snow or pure spring water."

Two hundred and thirty works have been credited to Al-Razi, about one half of them medical. He was the first to write on pediatrics and hay fever, and many other subjects. Aside from his contributions to medicine, he has left many

[1] Translated from Al-Rāzi's Treatise on the Smallpox and Measles, Arabic edition, 1872, p. 9, in the Syrian Protestant College. Beirut, Syria.

[2] Ibid, p. 6.

[3] Ibid., p. 74.

writings on theology, philosophy, mathematics, astronomy, music, chess, alchemy, and the natural sciences. His works on natural sciences deal with matter, space, time, motion, nutrition, growth, putrefaction, meteorology, optics, and alchemy, and the importance of these has been recognized in recent years. The concept of classifying alchemical substances as vegetable, animal, or mineral has come to us from Al-Razi and he divides the class of mineral into spirits, bodies, stones, vitriols, borates, and salts.

After Al-Razi the most illustrious name in Arabic medical annals is Abu Ali al Hausayn ibn Abdullah IBN SINA, or AVICENNA, from the Hebrew Aven Sina, (A. D. 980–1037). Avicenna, who was born in Bukhāra a thousand years ago, has been entitled al-shaykh al-Ra'is, the "Chief Master," or al-Mu allimu'th-Thani, the "Second Teacher," to wit, after Aristotle. To medieval Europe he was known chiefly for his eminence in medicine, but, to the orientalist the world over, he is one of those rare personalities, like Aristotle, Leonardo da Vinci, and Goethe, gifted with an encyclopaedic mind. In addition to his great medical achievements, he was a philosopher of note, a renowned mathematician, physicist, and an original thinker who was prolific in poetic and prose literature.

Avicenna's early education started with two tutors, one to teach the Koran and the other to teach literature. He continued these studies until he mastered them at the age of ten, and at this tender age he became conscious of his superiority. He proceeded to jurisprudence and other sciences and then turned to medicine which he did not find difficult to master. He became famous as a physician at a very young age. He says himself that his endeavors reached a climax with the study of philosophy and he was greatly troubled with its metaphysical problems until he studied the works of al-Farabi, the celebrated Turkish philosopher.

Avicenna began to write at the age of twenty-one and Brockelmann, in his *Geschichte der Arabischen Litteratur*, credits him with 68 books on theology and metaphysics, 11 on astronomy and natural philosophy, 16 on medicine, and 4 in verse, 99 books in all. He mastered the Arabic language and wrote mostly in this tongue. His most celebrated poem is the one describing the descent of the soul from the higher sphere into the body which is its home. The poem has rare beauty and is regularly memorized by young students in the Arab East. His philosophy was influenced by Aristotle as well as by al-Farabi, and the monumental work of his philosophy is *al-Nadjat*. In much of his work the mystical trend of his thought is very pronounced. His work *al-Isharat* is written in brief notes very much like Pascal's thoughts on modern philosophy. Neither aphorism nor essay, it centers mainly on ethics and mysticism. Avicenna concludes this work with the following advice to the student:

"Ah brother! In these gestures I churned for you the cream of truth, and entertained you with the pith of wisdom in the choicest words. Safeguard it from the ignoramuses and the

sarcastic, and from anyone who lacks keen talent and discipline, and chooses his companions among the populous or atheistic philosophers and their rogues. When you find that conscientious individual who enjoys your confidence, who is not easily moved by whim, and accepts the truth satisfactorily and honestly, he will ask you for its contents, gradually cognizant of the sequence from the precedent. He must pledge himself to you before God, and under oath from which there is no absolution, to emulate your example in his conduct. If you popularize this science or lose it, God will judge between us; sufficient to have God as my resort." (Isharat, Vol. 2, pp. 143–144.)[4]

His medical contributions were of inestimable value; he has been termed the Arab Galen. These writings displaced the works of Galen, Al-Razi, and al-Majusi, and became the textbook for medical education in the schools of Europe from the twelfth to the seventeenth centuries. His *Canon of Medicine* (*al-Kanun*), almost a million words, is undoubtedly his largest work. It is also one of the most famous works on medicine. In the words of the late Sir William Osler it has remained a "medical bible" for a longer period of time than any other work. It holds a unique position in the literature of the Moslem world and an esteemed position in modern thought. The main divisions of the Canon are:

1. General medicine.
2. Simple drugs.
3. Diseases affecting all parts of the body from the head to the feet
4. Special pathology and pharmacopoeia.

Avicenna in the *Canon* clearly differentiated between pleurisy and mediastinitis described the parasitic cause of ancylostomiasis, stressed the contagious nature of pulmonary tuberculosis, described diabetes mellitus, and listed over six hundred drugs in the section dealing with materia medica. Fifteen other medical works are known to be written by Avicenna.

The life of Avicenna was so colorful it resembles a celestial luminary which alternates between shining and being eclipsed as it revolves in its path. In his turbulent time the fighting princes either sought his services or persecuted him. During one interval he was head of the government, at another time he was put in jail, and on still another occasion he was escaping from one principality in order to seek refuge in another province. If forgiven, he would be recalled by a former patron to re-enter his service and undertake some scientific work. As he was intense in his intellectual endeavors, so he indulged his bodily pleasures, burning the candle at both ends and dying prematurely at the age of fifty-seven. He was buried at Hamadan, in Persia, where his tomb is still shown today.

Another original contributor to this Golden Age, and the last example in this brief study, is AL-HAITHAM the celebrated student of optics. Al-Haitham has been selected because he was the one man to influence the study of optics until the time of Kepler, because he was the sole authority on it from the eleventh to the seventeenth centuries, and because his original contributions to this science have but recently again come to light.

[4] Sa'di, Lutfi M. Avicenna, Bull. Near East Soc. 4: 3, 9, (June) 1951.

Abū-'Ali Muhammad al-Hasan ibn al-Hasan (al-Husain) ibn al-Haitham al-Basrī, who is known as ALHAZEN in medieval European sources, was born in Basrah 354 A.H. (A.D. 965) and died in Cairo 430 A.H. (A.D. 1039). The late Dr. George Sarton called him "the greatest Muslim physicist and one of the greatest students of optic of all times."[5] A man of remarkable intelligence, al-Haitham possessed broadly cultivated talents as an astronomer, a physician, and as one of the most important mathematicians of the Arab era. Besides his numerous original contributions he was an eager and diligent student and a prolific writer of commentaries on Aristotle, Galen, Ptolemy, Euclid, and Archimedes.

Because of the brevity of this paper only a limited account of the authorship of this outstanding scientist can be given. Ibn Abi Usaybi'a ascribes to Al-Haitham more than two hundred works on mathematics, astronomy, philosophy, natural science, and medicine. His writings on medicine, the least representative and the least original of his contributions, consist of a dozen treatises which show the influence of Galen. Mention will be made of only two, the most important and original works, *Kitab al-Manazir* (the book on optics) and *Al-Nour* (the book on light).

*Kitab Al-Manazir* (*Opticae Thesaurus*). The original Arabic text of this principal work of Al-Haitham was thought to be lost, until recently it was found in manuscript form in the Fatih and Topkapu libraries in Istanbul as a result of investigations by M. Krause (1934) and later those of Mustafa Nazif Bey (1943–44), professor of physics in the school of Engineering, University Fu'ad al-Awwal, Cairo, Egypt.

Al-Haitham acquired most of his knowledge of the anatomy of the eye from the Greeks, notably Galen through Hunayn. This borrowing, however, was done with thorough scientific criticism, which often resulted in discarding data obtained from previously accepted authors. One illustration is al-Haitham's rejection of the theory of vision then extant. He refuted the "emanation hypothesis" of his predecessors. Whereas they believed that the act of vision was carried on by rays (pneuma or visual spirit) which continuously emanate from the brain and enter the eye, passing out from the eye to the object and reverting to the eye, al-Haitham showed the opposite to be true, that the rays pass from the object to the eye. His own words are "The vision is accomplished by the light rays coming from the external objects of sight and entering the eye." Again he said, "The act of vision is not attained by means of the light rays emitted from the visual organ."[6]

He conceived that light fell upon the retina in the same manner that it falls on a surface in a darkened room through a small aperture. He believed, more-

[5] Sarton, George. Introduction to the History of Science, Baltimore, Williams & Wilkins, 1927, vol. I, p. 721.

[6] Sa'di, Lutfi M. Ibn-al-Haitham (Alhazen) medieval scientist. Univ. Michigan M. Bull. 22: 249–273 (June) 1956.

over, that the principal organ of sight is the crystalline humor (glacial sphere: lens and vitreous). He held that the act of vision is accomplished in such a way that the visual image caught by the crystalline lens is transmitted to the optic nerve, and through the intermediary of the optic nerve to the brain. From each and every point of the external object, a single ray is supposed to proceed to the eye, and to fall upon the lens. He asserted that the rays expand in striaght lines in an undulatory figure. They emanate from every part on the surface of the luminary with equal brilliance.

*Camera Obscura.* When light rays pass through an orifice, in a dark room, to a white surface on an opposite wall, they resume their undulatory figure and portray, in reverse, the body from which they originally emanated. Al-Haitham was the first to apply the principle of the camera obscura to the eye in order to explain the formation of the visual image.

He also observed the half-obscured shape of the sun and moon during eclipses on a wall opposite a fine hole made in the window shutters. This was the first record of the use of the camera obscura in astronomical observations. It was believed, in Europe, that Della Porta made the discovery (A.D. 1589) and it has also been ascribed to others of this period. But al-Haitham's astronomical observations on eclipses leave no doubt that he had a clear conception of the theory.

*Kitab Al-Nour* (*De Luce*). This book on light by al-Haitham was written in the last years of his life, and undoubtedly much later than his *al-Manāzir* in as much as he refers repeatedly to the latter for final experimental proof. Apparently more limited in scope than *al-Manāzir*, it deals almost exclusively with the nature and propagation of light. The Arabic text of *al-Nour* with a German translation by Johannes Baarmann was published in 1882.

The title page of al-Haitham's book on light appears as follows:

IN THE NAME OF ALLAH THE COMPASSIONATE, THE MERCIFUL

The discourse of Al-Hasan ibn al-Husan al-Haitham on light

"The studies pertaining to the nature (what) of light is in the domain of natural science, and the treatment of the (how) the light propagates is in the realm of mathematical science. . . ."[7]

Thus al-Haitham, from the outset, was aware that light and its propagation is a physicomathematical study. Prior to his time, natural scientists and philosophers differed on the nature of light. The scientists considered light as a heat generated by fire, and further considered light and heat as kindred. The difference was only in degree, not in kind.

In addition, al-Haitham produced very important studies on the rainbow, the halo, and spherical and parabolic mirrors. His works on twilight phenomena and the burning glass exist only in the Latin translation, the Arabic originals having been lost. All his work was of a highly complicated physicomathematical

[7] Ibid, p. 266.

character, and exhibited a scholarly and scientific conception of the nature of focusing, magnifying, and inversion of images.

Al-Haitham was an individual whose curiosity and love of knowledge elevated him to such scholarly eminence that he was universally acknowledged to be the greatest authority on optics, East and West, between Ptolemy (A.D. 150) and Kepler (A.D. 1604). It is understandable that, as late as 1600 A.D. a man of the caliber of Hieronymus Fabricius ab Aquapendente in his treatise on the eye respectfully called al-Haitham "Professor Alhazen." His contributions to the understanding of the eye, the most precious of all sense organs, were original and significant. His correction of error in the theory of vision rendered a service so important that no adequate science of optics could have been developed without it. His optical discoveries established the bases on which modern geometric and physiological optics have been founded. With these fundamentals of science well established, the development was assured of ingenious optical instruments which have enabled the human mind to penetrate the invisible world of bacteria and the cold reaches of the galaxies.

## The Age of Decline and Transmission to Europe (1100–1400 A.D.)

By the end of the thirteenth century religious dogma and political dissension held sway, unhampered and supreme. The decline was furthered by the onward movement of the Mongol Hulagu who sacked Baghdad, destroyed its libraries, and put to death the Caliph, Al-Musta'sim (1258 A.D.). The conquest of Granada by Ferdinand and Isabella in 1492 dealt a similar blow to the Arab culture in Andalusia. Under the hoofs of the Tartars in the East, Baghdad was buried and beneath the cross of Castile and Aragon a great portion of the invaluable treasure of Arab Spain was irrevocably destroyed.[8] This decline was further heightened by scholasticism divorced from life and theological obscurantism which prevailed and was instrumental in paralyzing Islamic culture until the nineteenth century.

About the beginning of the twelfth century, however, the storehouse of Arabic medicine had begun to be transferred to Latin Europe through many channels, the most important of which were:

1. The School of Medicine at Salerno, Italy.
2. The College of Translators at Toledo in Andalusia, Spain about 1175 A.D.
3. The Translation under the Norman Kings in Sicily.

*School at Salerno.* While monastic healing was dominant in Latin Europe, medical historians have noted the existence, at the beginning of the ninth century, of a health resort which was also the site of a medical school of considerable

[8] In 1499, under the leadership of Queen Isabella, her confessor Cardinal Ximenez caused to be destroyed by fire in the public square in Granada innumerable Arabic manuscripts. This destruction was repeated in many other cities. Merton, Reginald R. Cardinal Ximenez and the Making of Spain. London, Routledge, 1934, p. 77.

importance. This resort, basking on the beautiful Gulf of Paestum and endowed with the natural elements that are conducive to good health, was the beautiful city of Salerno about 35 miles southeast of Naples. Because of its position, Salerno, was destined by nature and location to play an important part in the Renaissance.

The proximity of Salerno to Sicily, one of the outposts of Arab dominion, laid it open to the raids of the Arabs. These were dual in nature, one military, the other cultural. It is with the latter that we have to deal.

Not far from Salerno, and closer to Naples, was the monastery of Monte Cassino, founded by St. Benedict, which preceded Salerno as a medical center. This was the Latin influence.

There is a popular legend that the School of Salerno was founded by four physicians, a Greek, a Latin, an Arab, and a Jew who met frequently and decided to establish this school, which was destined to become the mother of all European universities. Then, about the time of the Norman conquest, in 1075 A.D., we encounter an eminent Arabic Latinizer whose name is predominantly connected with the School of Salerno and its rise to importance, Constantinus Africanus, who was called the "Miracle Man from the Orient."

This Carthaginian physician, who had previously traveled through Egypt and Syria, came to Salerno under the patronage of Robert Guiscard, the Norman conqueror. Very little is known about his early history; and historians disagree about his nativity. It is commonly supposed that he became a Christian in order to avoid persecution. But as a native of Carthage, which was Arabian long before Salerno became famous, it is not unlikely, in my opinion, that he was an Arab. It is the opinion also of Max Meyerhoff that Constantine was an Arab.[9] Moreover, one's attention is called to the fact that the style of Latin in which he rendered his Arabic translations was barbarous, which tends to indicate that Latin was not his native tongue.

To Salerno he introduced, among other works, his *Pantegni*, "the Whole Art," which was in reality the Royal Book (*Al-Maleki*) of Ali Abbas, an encyclopedic work of medicine and surgery. A comparison of the *Pantegni* with Ali Abbas's *Royal Book* shows a remarkable likeness. In fact, the *Pantegni* faithfully followed the *Royal Book* in dealing with anatomy, internal medicine (fevers, symptoms, prognosis), uroscopy, dietetics, surgery, and obstetrics. This is particularly true of anatomy.

It is estimated that the works translated by Constantine total almost two score texts on medicine and philosophy. He also translated into Latin Hippocrates' *Aphorisms* from Hunayn's Arabic version with Galen's commentary from Hubaysh's version, Hippocrates' *Prognostica and Diaeta Acutorum*, besides many works of Galen. They were received most favorably by the medical

[9] Ibadi, Hunain ibn Ishaq. The Book of the Ten Treatises on the Eye, trans. by Max Meyerhof. Cairo, 1928, p. 34.

school of Salerno. Being far superior to the early Salernitan system or anything else then available, they forthwith found ready application and played an important role not only in Arabizing the School of Salerno but also in influencing subsequently the medical thought of Western Europe. The translations of the Arabic medical and philosophical manuscripts absorbed all the years of his activity before and after Salerno knew him. He spent his last years as a monk in the Benedictine monastery at Monte Cassino where he died in 1087 A.D.

The decline of the great center of medical knowledge at Salerno is attributed to more than one cause. First, it was in the path of Henry VI of Hohenstauffen in the course of his conquest, but the most important reason was the growing prominence of the schools of Montpellier, Padua, and Bologna. Montpellier was fast becoming the field of transplantation of later Arabic medical literature through the medium of the College of Translators at Toledo.

*College of Translators at Toledo of Andalusia, Spain.* From the beginning of the eighth century the Spanish peninsula had been inundated by Arabic culture under the influence of the Ummayad Dynasty of Cordova. In the tenth century, Cordova was the most civilized city in Europe with a population of about one million. It had 300 mosques, 70 libraries, 900 public baths, and 50 hospitals. The University which was founded in the eighth century, was a center of learning even for Christians who braved the censure of their friends to study at this most renowned university in Europe.[10] Along with Seville and Toledo, it was destined to become the renowned center of learning in the Western Caliphate. The high level of culture reached by the Arabs in Spain can be seen in their architecture, which is still standing today, such as the Giralda and Alcazar in Seville, the mosque at Cordova, and the Generalife and Alhambra at Granada.

About 1085 A.D. Toledo, one of the greatest centers of Muslim learning, fell to the Christians. With this retreat, students who admired Arabic learning (Artes Arabum) began to flock to the center from all over Euope about the end of the twelfth century. Toledo now became the site of great literary activity from the middle of the twelfth to the middle of the thirteenth centuries, through the establishment there by Archbishop Raymond of a college of translators. It was here that Gerard of Cremona, the Lombard, spent the greater part of his life translating Greek and Arabic masterpieces, over 70 in number. In medicine he translated Hunayn's versions of Hippocrates and Galen, also *al-Kindi*, Avicenna's encyclopaedic *Canon*, and Abu-l-Qasim's famous surgery *al-Tasrif*, or *The Method*. His translations, though faulty, were an inspiration to others who improved upon them.

*Sicily. Translations under the Norman Kings.* Sicily fell into the hands of the Normans in 1091 A.D. after being under Muslim rule for 130 years. Greek,

[10] Major, Ralph H. History of Medicine, Springfield, Ill., Charles C Thomas, 1954, vol. 1, p. 249.

Arabic, and Latin vernacular and dialects were the common languages, but there were scholars, particularly Jews, who knew the literary form of these languages. Many learned men, regardless of language or religion, were attracted to Palermo, Sicily, during the reigns of Roger I, Frederick II, Manfred, and Charles I of Anjou, and Sicily was to become a fertile center for the spread of Arabic science. The early translations were mostly in astronomy and mathematics and no important translations in medicine came out in the twelfth century.

In the thirteenth century, however, the Jews in Sicily had a significant part in the work of translation. The encyclopaedic medical works of al-Rāzi were translated into Latin by the Sicilian Jewish physician, Faraj ben-Salim (Farragut) in 1279 A.D. under the auspices of Charles I of Anjou, and these multiplied into numerous manuscripts during the succeeding centuries. Although this was the only major medical work rendered into Latin in Sicily, and although some of the Arabic books were done again and better in Toledo, nevertheless Sicily's contribution was of prime importance. Since the Norman kings and their successors on the Sicilian throne held not only the island but also Southern Italy, they provided a bridge for the transmission of Muslim culture into the peninsula and mid-Europe.

"When these translations were new to Europe, and especially in the thirteenth century, they caused much stir. In this awakening a large part was played by the Universities. These were established in numbers during the thirteenth and the following centuries. University life gradually came to exercise a profound effect on social, political and intellectual conditions. In most of the Universities Medical Faculties grew up. The medical teaching was entirely theoretical and there was no clinical instruction, though at the beginning of the fourteenth century some advance was made by the introduction of brief and superficial anatomical demonstrations."[11]

Through these centers Arabic medical thought, with hundreds of translations, found fertile soil in the Universities of Bologna, Padua, Naples, Montpellier, Paris, Oxford, and others which were established from the twelfth century onward, and provided a strong impetus to the Renaissance.

[11] Singer, Charles J. *A Short History of Medicine*, New York, Oxford University Press, 1928, pp. 70–71.