

Islamic Physicians

Medicine in Islam passed through three stages:

I. The first stage is the stage of translation of foreign sources into Arabic. It extended mainly during the seventh and eighth centuries.

II. The second stage is the stage of excellence and genuine contribution in which the Islamic physicians were the leaders and the source of new chapters to medicine. This stage extended during the ninth through the thirteenth centuries.

III. The third stage is the stage of decline where medicine, as well as other branches of science, became stagnant and deteriorated. The stage started mainly after the thirteenth century.

During the first stage, Syrian and Persian scholars did a marvelous job by translating honestly the ancient literature from Greek and Syriac in Arabic. They translated different branches of science including philosophy astrology, and medicine. The works of Hippocrates (460–370 BC), Aristotle (384–322 BC), and Galen (131–210 A.D.) were among those translated. From Arabic, the classic Greek literature was translated into Latin, then into Greek because most of the original scripts were lost and the only source was the Arabic translation.

If the Arabs did only one thing, namely, preserving the ancient literature and handing it honestly to Europe, that would have been a sufficient contribution in itself. The Moslem rulers encouraged translation, e.g. Khalif Al-Mamun Al-Abbassi paid the translator the weight of his translation in gold (Haddad 1942). Among the eminent physicians who took part in the first stage were Jurjis Ibn-Bakhtisliu, his grandson Jibril, Yuhanna Ibn-Masawayya, and Hunain Ibn-Ishak; most of them were Christians, yet they were respected and well treated by the Moslem rulers.

It is said, rightly or wrongly, that the history of a nation is the sum total of the history of a few of its individuals. This is particularly true in the history of medicine during the Arab period. In every stage of its development we find men of outstanding repute, the sum of whose efforts has constituted this magnificent chapter. It is impossible to give an account of all the important physicians of Islam.

We thus are going to discuss some of those who were known to Medieval Europe and whose books affected its thinking and practice for centuries (Table 1), I chose an internist, Al-Razi (Razes); a surgeon, Al-Zahrawi (Abulcasis); the physician-philosopher of Islam, Ibn-Sina (Avicenna); the philosopher-physician of Islam, Ibn-Rushd (Averroes); a pioneer in physiology, Ibn-Al- Nafis; and a Jewish Arab, Ibn- Maimon (Maimonides).

Al-Razi (Razes)

Al-Razi (Razes) 841-926 A.D.

His full name is Abu-Bakr Mohammaed Ibn-Zakaria Al-Razi, known to the Western World as Razes. He was born in Ray, a suburb of Tehran, the capital of modern Persia (Profile of Iran 1977, Sarton 1950). He first studied music which was his main interest in his early life. He was a skillful player on the lute. He then studied philosophy, and later medicine. But he was a better physician than a philosopher.

He first became the Court-Physician of Prince Abu Saleh Al- Mansur, the ruler of Khorosan. Then he moved to Baghdad where he became the Chief Physician of the Baghdad Hospital and the Court-Physician of the Caliph. He had a good basis of physics and chemistry as well as medicine.

He published several books which were translated into Latin, French, Italian, Hebrew, and Greek. One of his main books is "Al-Mansuri" (Liber Al-Mansofis) which he dedicated to his patron Prince Al-Mansur. It was composed of ten treatises and included all aspects of health and disease. He defined medicine as "the art concerned in preserving healthy bodies, in combating disease, and in restoring health to the sick." He thus showed the three aspects of medicine namely, public health, preventive medicine, and treatment of specific diseases he listed seven principles for the preservation of health:

1. Moderation and balance in motion and rest.
2. Moderation in eating and drinking.
3. Elimination of superfluities.
4. Improvement and regulation of dwelling places.
5. Avoidance of excessive evil happenings before they become uncontrollable.
6. Maintenance of harmony in ambitions and resolutions.
7. Acquisition of reticence through possession of good habits including exercise.

He also published another book called "Al-Murshid". In it, he emphasized the important lines of therapy that we mentioned earlier. He described the different types of fever including continuous, relapsing, and hectic. He stated that fever can be a symptom of a disease or a disease in itself. He introduced mercury as a therapeutic drug for the first time in history, which was later adopted in Europe. He realized that a man normally does not want to get sick, and he wants to recover as soon as possible.

However, if a patient does not have the will or the desire to get well, the physician's hands are tied and

cannot help him. He stressed the continued medical education of the physician. He advised him to record his own observations. He encouraged him to meet with other physicians to discuss medical problems. He recommended that the physicians should try solving these problems rather than depending on others for finding solutions.

Another book written by Al-Razi was named "Al-Hawi", which means the complete text. It was composed of 22 volumes. It was one of the main text books in the medical school in Paris, especially its 9th volume on pharmacology.

He wrote a treatise on measles and smallpox called "de Peste or de Pestilentia" which was translated to Latin in 1565 A.D. It is a masterpiece in clinical medicine (Browne 1962). It describes the clinical difference between the two diseases so vividly that nothing since has been added (Keys 1971).

Al-Zahrawi

Al-Zahrawi (Abulcasis, Bucasis, Alzahravius) 930–1013 A.D.

His full name is Abu-Al-Qasim Khalaf Ibn'Abbas Al-Zahrawi. He had been known in the Western World as Abulcasis, Bucasis or Alzahravius. He is the famous surgeon of the Arabs. In 930 A.D., he was born in Al-Zahra, a suburb of Cordova. He attended the University of Cordova which had been established for one and a half centuries. At that time Cordova had a population of one million (Hitti 1977). It was the magnificent capital of Al- Andalus where culture and science were at their peak in Europe. In military power the Moslems also reached their zenith, not only in Spain but also throughout Europe after King Abdel-Rahman III defeated the Spanish kings of Navarre, Castile, and Leon at the north in 997 A.D.

Al-Zahrawi became an eminent surgeon. He was appointed as the Court-Physician of King Abdel-Rahman III. He spent a productive life in Practicing medicine, especially in surgery and medical writings. He died at the age of 83.

He wrote mainly four books. One of them is "Al-Tasrif Liman Ajiz'an Al-Ta'rif" which is the best medieval surgical encyclopedia. It was used in Europe until the 17th century. He stressed the importance of basic sciences: "... Before practicing, one should be familiar with the science of anatomy and the functions of organs so that he will understand them, recognize their shape, understand their connections, and know their borders.

Also, he should know the bones, nerves, and muscles, their numbers, their origin and insertions, the arteries and the veins, their start and end. These anatomical and physiological bases are important, and as said by Hippocrates: 'These are many physicians by title and a few by practice.' ... If one does not comprehend the anatomy and physiology, he may commit a mistake that can kill the patient. I have seen someone, who pretended to be a surgeon, incised an aneurysm in the neck of a woman, mistaking it for an abscess. The woman bled to death."

Heller stated that Al-Zahrawi described the ligation of arteries long before Ambrose Pare (Khairallah 1942). Al-Zahrawi also used cautery to control bleeding. He used wax and alcohol to stop bleeding from the skull during cranial surgery. Sprengel said that Al-Zahrawi was the first to teach the lithotomy position for vaginal operations (Khairallah 1942). Al-Zahrawi also described the tracheotomy operation and performed it as an emergency on one of his servants.

He was the first to write on orthodontia. He showed evidence of great experience from details of clinical picture and surgical procedures e.g. his description of varicose veins stripping, even after ten centuries, is almost like modern surgery (Al- Okbi 1971): "... Have the leg shaved if it is much hairy.

The patient gets a bath and his leg is kept in hot water until it becomes red and the veins dilate; or he exercises vigorously. Incise the skin opposite the varicose vein longitudinally either at the ankle or at the knee. Keep the skin opened by hooks. Ex- pose, dissect, and separate the vein. Introduce a spatula underneath it.

When the vein is elevated above the skin level, hang it with a blunt rounded hook. Repeat the procedure about three fingers from the previous site and hang the vein with another hook as previously done. Repeat the procedure at as many sites along the varicose vein as necessary. At the ankle, ligate and strip it by pulling it from the incision just above. When it reaches there, repeat at the higher incision until all of it is stripped.

Ligate the vein and then excise it. If difficulty is encountered in pulling it, ligate its terminal part with a string and pass it un- der the spatula and dissect it further. Pull gently and avoid its tearing because if it does, it becomes difficult to strip all of it and can cause harm to the patient.

When you have stripped it all, put alcohol sponges at the sites of the skin incisions and take care of the incisions until they heal. If the varicose vein is tortuous, you have to incise the skin more frequently, at each change of direction. Dissect it and hang it with the hooks and strip it as previously described. Do not tear the vein or injure it. If this happens, it becomes difficult to strip it. The hooks used should be blunt, eyeless, and rounded, otherwise it can injure the vein".

He also wrote about fracture of the skull (Al-Okbi 197 1): "... The types of skull fractures are numerous, their shapes are different, and their causes are many. For example, some skull fractures are due to a blow by a sword that splits the whole skull and reaches the dura, the same as the ax does to the wood, therefore it is called axial fracture. Sometimes the sword does not split the skull completely; it is thus called incomplete axial fracture. Such a fracture can be small or big.

Another type is comminuted fracture which can be due to a hit by a stone or a fall on a stone; and this fracture can reach the dura or only be limited to the outer part of the bone. This fracture can also be small or big. A third type is the hairy type of skull fracture which is so tiny and linear like a hair.

A fourth type is the depressed fracture which occurs due to a fall or a blow so the bone is depressed like

a brass jar when hit by a blunt instrument. This usually happens when the bone is soft as children. The types of these fractures are diagnosed by examining the wound, removing the debris and contused part of the scalp, exposing the skull, and feeling it by the spatulas. The hairy fracture is difficult to discover and can be diagnosed by exposing the skull and smearing it with ink; the linear fracture thus appears stained."

In the treatment of fractures of the skull, Al-Zahrawi wrote:

"... If the patient shows serious signs such as high fever, repeated vomiting, exophthalmos, convulsions, and coma, do not touch him because he is probably going to die. Otherwise, treat him as follows: first shave the patient's head. In comminuted depressed fractures, these pieces of bone should be removed as will be explained. If in the process of the patient's examination or during surgery bleeding occurs, it can be controlled by pressure using towels soaked in alcohol and by wax. Then after control of the bleeding, the small pieces of bone are removed using special forceps.

To remove the depressed fracture, first, make trephines in the healthy bone around it. These trephine instruments should not penetrate beyond the skull into the soft tissues underneath, thus they are called non penetrating trephines. They have a rounded ring in their proximal end to prevent them from penetrating beyond certain depths. You should have a number of these trephines that can stop at different depths depending on the thickness of the skull. Connect the holes in the skull using special saws.

First, use a fine small saw, then larger ones. These should be sharp and made of steel. Avoid cutting the dura by the trephine or saw. Once the depressed bone is freed, remove it gently, then smoothen the edges of the skull by special instruments. Wash with alcohol and treat the wound with packs soaked with ointment."

Al-Zahrawi described many dental operations such as dental extractions, fixation, re implantation, and artificial teeth. He described referred tooth pain and cautioned the physician against removal of the healthy tooth to which pain is referred. He used gold threads to fix teeth because other metals would tarnish and cause a reaction. Chapter 6 of his book was all devoted to foreign bodies of the ear and their treatment. He also devoted one whole chapter to midwifery, giving tips to midwives, and describing the problems of difficult labor and obstetrical maneuver.

He recommended decompression of the fetal head for obstructed labor and described the instruments used. He described the management of liver abscess by treating it into two stages (Khairallah 1942). The first stage was to allow adhesions around it and to close it from the peritoneal cavity. The second stage was to incise it..."If the procedure is done in one stage, the pus may spread to the whole abdomen and the patient may die."

He described a total of 200 surgical and dental instruments most of them were original (Fig. 3). He said "... Choose your instruments carefully beforehand according to the operation. However, you should

design other devices if needed." Thus he encouraged the physician to be innovative.

During the time of Al-Zahrawi, surgery in the Islamic world became a respected specialty practiced by reputable physicians. On the contrary in Europe, surgery was belittled and practiced by barbers and butchers. In 1163 A.D., the Council of Tours declared the following resolution "Surgery is to be abandoned by the schools of medicine and by all decent physicians."

Ibn-Sina

Ibn-Sina (Avicenna) 980–1037 A.D.

Ibn-Sina's full name is Abu-Ali Husayn Ibn-Abdullah Ibn-Sina, and his titles were Al-Shaykh Al-Rais (The chief Master) or Al-Muallim Al-Thani (The Second Teacher), second to Aristotle (Browne 1962). He is known in the Western World as Avicenna.

In 980 A.D. Avicenna was born in Bukhara which is now part of Russia and known as Uzbek. By the age of 10, he was already proficient in the Qur'an and Arabic classics. By the age of 16, he finished Islamic law studies, geometry, anatomy, logic and philosophy. His metaphysics were influenced by an earlier philosopher in Islam, Al-Farabi. By the age of 18, he completed the study of medicine.

Soon after, he became the Prime Minister (the Visier) and Court-Physician of Prince Nuh Ibn-Mansur, the Samanid Ruler of Bukhara. The prince was impressed by the intelligence and endurance of his Visier and opened for him the royal library which was unique in its literary richness. Ibn-Sina wrote his first book at the age of 21.

Then he became Visier of Ali ibn Maimun, the ruler of Khawarazm or Khiva. But he ultimately fled to avoid being kidnapped by the Sultan Mohammed El-Ghazni. Ironically, fate played an important role in the life of Avicenna who was a master in planning. The ruler of Hamadan, the southern part of Persia, who was called Amir Shamsu'd-Dawla, had renal colic. Ibn-Sina treated the Amir's colic. The latter was very pleased and appointed Ibn-Sina, not only his Court-Physician but also his Visier. Avicenna was a proud and arrogant man.

This created enemies leading to a mutiny of the military leaders against him resulting in his dismissal and imprisonment. Fortunately, the Amir got renal colic once more and no one could relieve his pain. He thus summoned back Avicenna who cured him. The Amir apologized to Avicenna and reinstated him.

Avicenna's life during this time was extraordinarily strenuous. All the day he was busy with the Amir's services. The great part of the night was passed in lecturing and writing his books, with intervals of wine-drinking, music, and minstrelsy. After many vicissitudes, worn out by hard work and hard living, Avicenna died and was buried in Hamadan, Persia, in 1037

A.D. at a comparatively early age of 57. In his last illness, he treated himself unsuccessfully, so that it

was said by his detractors that neither could his physics save his body nor his metaphysics save his soul (Browne 1962).

Avicenna wrote 100 treatises, 21 of them were major of which 16 were in medicine. He wrote in philosophy, medicine, named *Al-Qanon fi Al-Tibb* (Canon of Medicine). It was an encyclopedia containing more than one million words. It was composed of 5 volumes:

Volume I– described the principles and theories of medicine.

Volume II– contained the simple drugs arranged alphabetically.

Volume III– described localized diseases of the body from the head to the toes.

Volume IV– was addressed to generalized diseases of the body e.g. fevers.

Volume V– explained compound drugs.

The Canon contained all medical knowledge up to the 10th century. It was translated to many languages and was the reference for medical schools in Europe up to the 17th century. Although the Canon was a great book, it overshadowed the important works prior to it by Al-Razi and Al-Zahrawi, and subsequent to it by Ibn-Al-Nafis and Ali Ibn- Abbas, Halle Abbas, (Haddad 1942).

Avicenna wrote Arabic and Persian poems. The last of his Arabic poem, which is considered a classical beauty, describes the descent of the Soul into the Body from the Higher Sphere which is its home (Browne 1962).

Avicenna is considered a great philosopher, and his writings affected the thinkers and influenced many of those who appeared after him. He was a unique phenomenon, not only because of these encyclopedic accomplishments in medicine, but also because of the versatility of his genius. He has been compared in this respect with Aristotle, Leonardo da Vinci, and Goethe. (Keys 1971).

Ibn-Rushd

Ibn-Rushd (Averroes) 1126–1198 A.D.

Ibn-Rashid, or Averroes as known in Europe, was born in Granada in 1126 A.D. He studied philosophy, medicine and law. He was appointed as a judge in Seville in 1169 A.D. where he stayed in office for a quarter of a century. He was affected by Aristotle on whom he wrote important commentaries (Black 1970, Al-A'sar 1972). In these interpretations he asserted that the human soul is not independent, but shares a universal mind. This belief caused a great controversy and was later declared heretical by both the Moslems and Christians alike because it contradicted the doctrine of personal immortality.

He was admired by the Jews of Spain who spread philosophy into Europe especially into Italy and France after they were forced out of Spain. His followers interpreted some of his writings to mean that there are two kinds of truth, a philosophical and a religious truth. This implied a separation of reason and faith and influenced philosophical and theological speculation for many centuries. Because of his bold

ideas, he was dismissed from his work and sent to Morocco where he was kept in prison till he died on December 12, 1198. his important contribution to medicine was "Al- Kulliyat fi Al-Tibb" (Colliyet).

It was a summary of the medical science at that time and composed of seven parts. He wrote another book, "Al-Taisir" on practical medicine. It consisted of useful excerpts and a clinical description of diseases including serous pericarditis and mediastinal abscess. He personally suffered from the latter disease and left very careful records of his own symptoms. The book is not known in Arabic, but there are several Latin editions (Haddad 1942). Ibn-Rushd was another example of the cultured Arabic physician.

Ibn-Maimon

Ibn-Maimon (Maimonides) 1135–1204 A.D.

In 1135, Musa Ibn-Maimon (Moses Maimonides) was born in Cordova, Spain (Minkin 1968). His father was a Rabbi and had a great influence of Moses in his interests and future achievements. During that period, the Jews had a golden era in Spain. Minkin (1968), a renowned scholar and an eminent Rabbi wrote "It was Mohammedan Spain, the only land the Jews knew in nearly a thousand years of their dispersion, which made the genius of Moses Maimonides possible."

In 1160 A.D., Moses emigrated to North Africa to the city of Fas where he studied medicine. In 1165 A.D., he left to Palestine. However, he was dissatisfied with the cultural atmosphere. Therefore, he went to Egypt where he stayed until he died in 1204 A.D. He was buried in Teberias, Palestine.

Maimonides first started his career as the Rabbi of the Jewish Community of El-Fostat city, the capital of Egypt at that time and part of old Cairo now. Later, in life, he practiced medicine. He became an eminent and respected physician. He served both Kings Salah-El-Din (Saladin) and his elder son Sultan Al-Malik Al-Afdel during his short reign (1198–1200 A.D.). He had the confidence of both. During Salah-El-Din war with King Richard, the Lion-Hearted, the latter fell sick.

Although those two kings were at war, they had respect and admiration of each other. Saladin sent Ibn-Maimon to Richard to treat him. After being cured, Richard asked Ibn-Maimon to join his court. But the latter politely declined and preferred to stay with Saladin (Minkin 1968).

Ibn-Maimon's impact on the Jewish religion is very important. He wrote classical work in the Jewish religion including codification of the Jewish laws (Black and Roth 1970). He also wrote in philosophy. His book, "Dalalat Al-Hai'ran" (The Guide of the Perplexed) is an important achievement which was welcomed not only by those of the Jewish faith but also by Moslems and Christians alike. He was affected by his contemporary Ibn-Rushd, and by Aristotle, but he tried to unite logic and faith. He wrote his book in Arabic. He did not live long enough to see the Hebrew translation of his book which would have given him a great satisfaction.

In medicine Ibn-Maimon did two important things: First, he translated many Arabic books into Hebrew which were then translated into Latin and other European languages. An example of these books is the Canon of Avicenna. Second, he wrote a few books of his own. One of them is "Magala fi Tadbir Al-Sihha" (Regimen Sanitatis) which stressed proper diet, personal hygiene, and moderation in the pleasures of life. It was in the form of letters to the Sultan Al-Afdel. The other was "Kitab" Al-Fusal fi Al-Tibb" (Fisul Musa). This was a collection of 1,500 aphorisms extracted from Galen writings together with forty-two critical remarks. Moses also wrote a book on poisons and their antidotes (Al-A'sar 1971).

When he died, the Jewish Community in Egypt built a synagogue named after him. Some Jews, up-till-now, stay overnight in this synagogue in hope of receiving healing through the spirit of this great physician (Minkin 1968).

Ibn-El-Nafis

Ibn-El-Nafis 1208 – 1288 A.D.

In 1208 A.D., Ala'El-Deen Ibn-El-Nafis was born in a small town near Damascus called Kersh (Fig. 7) (Ibrahim 1971). He learned medicine and philosophy in Damascus and spent most of his life in Cairo. He was a physician, a linguist, a philosopher, and a historian. He was the first chief of Al-Mansuri Hospital in Cairo and the dean of the School of Medicine in 1284 A.D.

During this era, the medical profession together with other branches of science were passing a crisis. The Mongol Tartar invasion and destruction of Baghdad in 1258 A.D. caused an injury to the Islamic civilization from which it never recovered. It destroyed forever the Caliphate, symbolic unity of the Arabian Empire, and the preeminence of Baghdad as a center for learning.

Also during that period Islamic culture was declining in Spain. It was then Cairo and Damascus the centers for education and medical prestige. There, the medical profession was characterized by the freedom of discussion and expression of opinion, something that was very new in medicine and not known to Europe until the 17th century when introduced to England by Sedenham (Ibrahim 1971).

Ibn-El-Nafis was a dedicated person. He used to start his day after dawn prayers by making rounds at the hospital, followed by case discussions with students and colleagues, then hospital administration. His evenings were spent reading, writing and discussing medicine and philosophy with frequent scholar guests at his home in El-Husseini District in Old Cairo. His house was an example of beautiful Arabic architecture, made of marble with a fountain in the central hall.

In the history of mankind, there are persons whose importance is revealed with the flight of time and their truth glows with the passage of centuries; Ibn-El-Nafis is one of those. He wrote many books, ten of them in medicine and a special one in philosophy. In the latter book "Fadel Ibn-Natik", he tried to present the counter point of the philosophical view of Avicenna expressed in his book "Hai Ibn-Yakzan".

He was an authority in theology on which he wrote several books, e.g. "The complete Message of the Prophet" and "Al- Ragol Al-Kamel" (The Perfect Man) supporting Unitarianism. Ibn-El-Nafis had an important character, not being a follower but a scholar. This was evident in his writings whether in philosophy or medicine.

In medicine he wrote many books, two of them are "Mujaz Al- Qanun" which means the "Summary of the Canon". In these two books which were based on Avicenna's writings, he criticized the short comings of Avicenna's book and of Galen's views and added to them. That is why he was named by some as Avicenna the Second.

For example, he wrote "... We have relied chiefly on his (Galen) teachings, except in a few details which we think are wrong and were not given after a thorough investigation. In describing the function of the organs, we have depended on careful investigation, observation, and honest study, regardless of whether or not these fit with the teachings and theories of those who have preceded us."

Ibn-El-Nafis added lights to the physiology of the circulation. In the ancient history, Erasistratus of the Alexandria School (310 B.C. – 250 B.C.) believed that blood was contained only in the right side of the circulation, namely the veins and the right side of the heart. The left side of the circulation, namely the left side of the heart and the arteries were supposed to contain air because arteries were found empty when an animal was sacrificed, hence the name "arteria".

When Galen came (131 – 210 A.D.), he described blood to pass from the right side of the heart to the left side through minute openings in the septum of the heart, then it mixed with air from the lungs, and sequently distributed to the whole body. For centuries this was the prevalent belief and no one, including the Arab physicians and their eminent writer Avicenna, could dare to challenge this sacred view, Ibn-El-Nafis did. Five times he stated in unmistakable terms that "... the blood from the right chamber of the heart must arrive at the left chamber, but there is no direct pathway between them.

The thick septum of the heart is not perforated and does not have visible pores as some people thought or invisible pores as Galen thought. The blood from the right chamber must flow through the vena arteriosa (pulmonary artery) to the lungs, spread through its substance, he mingled with air, pass through the arteria venosa (Pulmonary vein) to reach the left chamber of the heart... " (Salem 1968). In describing the anatomy of the lung Ibn-El-Nafis stated: "The lung is composed of: first, the bronchi: second, the branches of the arteria venosa; and third, the branches of the vena arteriosa; all of these are connected by loose porous flesh ... The need of the lung for the vena arteriosa is to transport to it the blood that has been thinned and warmed in the heart, so that what seeps through the pores of the branches of this vessel into the alveoli of the lung may mix with what is of air therein and combine with it ... and the mixture is carried to the left cavity of the heart by the arteria venosa" (Haddad 1936).

Ibn-El-Nafis also made other contributions in the circulation. Avicenna, following Galen's description of the anatomy, stated that the human heart has three ventricles. Ibn-El-Nafis rejected that as he said "...

And his statement (Avicenna's) that the heart has three ventricles is not correct, as the heart has only two ventricles... " He was also the first to describe the coronary circulation as he wrote "... Again, his statement (Avicenna's) that the blood in the right side is to nourish the heart is not true at all, for the nourishment of the heart is from the blood that goes through the vessels that permeate the body of the heart... "

Three centuries after the discovery of the pulmonary circulation by Ibn- El-Nafis, others, such as Michael Servetus, Realdus Columbus, Carlo Ruini, Andrea Cesalpino, and Francois Ra- belais, claimed the same thing (Mayerhof 1935). There is a strong suspicion that these authors obtained their knowledge from the Arabic literature which was available at that time to the European investigators without giving credit to Ibn-El- Nafis (Keys 1971, Haddad 1942).

It is considered to be more than a coincidence that Servetus would discover the pulmonary circulation, and also to write a book, similar to that of Ibn-El-Nafis, on Unitarianism. Servetus was burnt with his book, "Restitutio Christianismi" in Geneva in October 1553 at the order of Calvin because he was considered heretic.

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