

## Ibn an-Nafis. The Minor Circulation

### *Ibn an-Nafis. La circulación menor*

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Islamic medicine was contained within its own theological principles. In this way, Muhammad's assertions, as for example: "if a sick person asks for something, it must be given to him", "there are only two sciences, theology (salvation of the soul) and medicine (salvation of the body)", "ye that serve God, love", promoted a medical ability inserted within the activity of the prophets. Initially, these circumstances determined the development of public medicine, which coexisted in perfect harmony with religious practice. Subsequently, the study of Greek texts, and the appearance of the Arabic works themselves, through physicians of the stature of Ibn-Sina, called Avicenna (980-1027), Avenzoar (1091-1162), Averroes (1126-1198) and Maimonides (1139-1205), turned it into a scientific medicine.

The development of hospitals between the twelfth and thirteenth centuries bear witness to the growth of Arab medicine, Ibn an-Nafis being undoubtedly one of its most valuable exponents. In the light of current historical knowledge, Ibn an-Nafis was the first to describe the pulmonary circulation. During his life, he had the privilege of acting in an environment characterized by the protection of the sciences. Although the 13th century did not change the dogmatic attitude evidenced towards the works of Galen (130-201), Rhazes (865-932) and Avicenna, it was nonetheless able to show some progress thanks to the protection services carried out by three Arab princes: Nouri al-Din Zenki, Al-Mansour Qalawun and the Great Saladin. They founded medical schools and hospitals, such as the one in Nuri (Damascus), and the ones of Nasiri and Mansoury in Cairo. This cultural environment was the ideal breeding ground for Ibn an-Nafis, born in this evolutionary time of medicine and Arab society, in Damascus in the year 1210.

His biographical trace is scarce in the work of Ibn Abí Usaybia (Damascus, 1203-1273), an ophthalmologist and medicine historian, who recounts the lives of 399 doctors of that time in a book entitled "Sources of Information on Classes of Physicians". Tall, slim, single and chivalrous, he studied in Nuri (Damascus), and then moved on to Cairo. As teachers he had al-Dahwar (Syria) and Ibn-al-Tilmid. In addition to medicine, he also cultivated philosophy and law. Entirely dedicated to science, he is presented with a high moral content in his treatment of patients. His personality and the

way of "being a doctor" are quite similar to those of who centuries later would be the great French doctor René Téophile Hyacinthe Laennec (1781-1826).

A passionate defender in his therapeutic conception of the Hippocratic "*vis medicatrix naturae*", he was, according to Asnauri, the "first authority of all medicine", also called the "miracle of his time, both in the East and in the West". He became the chief physician in Egypt at the Mansoury hospital, being very dedicated to the care of his patients. Ibn an-Nafis, who must be considered the last creator of Muslim medicine, wrote several works, including: "*The Honest Book on the Eyes*", "*Commentary on Hippocrates' Aphorisms*", "*Dissertation on the Diseases of Children*", "*Study on the Triple Birth*", "*Collection of Accuracies of Medicine*", "*Commentaries on Hippocrates' Epidemics*", not finishing his compendium "*The Great Book*", which should have reached 300 volumes, and of the which only eighty were completed.

In his text "*Commentaries on Anatomy in Avicenna's Canon*" (1245), when making some reflections on books I and II of the "*Canon*", and expressly referring to the ventricles of the heart, Ibn an-Nafis makes a perfect description of the minor circulation. By denying the existence of pores in the interventricular septum, his challenge to the work of Galen and Avicenna is strikingly solid and courageous for that time. Where Avicenna says "there are three ventricles in the heart", he literally establishes a break by expressing "the heart has only two ventricles; the right one that is full of blood and the left one that is full of spirit. There is no communication between the two ventricles, because in this case the blood would penetrate into the side of the spirit, distorting its virtue. Anatomy has disproved Avicenna's claim. The interventricular septum is so dense that neither blood nor spirit can go through it. It is wrong to say that it is always shaken. This is false, because the blood enters the left ventricle from the lung, after it has been rewarmed and been passed from the right ventricle, as we have previously stated".

Nafis may have carried out comparative anatomy studies on various animals, which allowed him "*ob oculo*" to make the description of the minor circulation, as he writes later in his "*Commentary*": "But there is no communication, as some thought there was between these two cavities, because the interventricu-

*lar septum is hermetic, without any apparent fenestration in it. Not even as Galen maintained, some invisible pores would be appropriate for the passage of this blood, because these pores are not obvious, and the septum is thick. Therefore, the blood, after becoming subtle, passes through the vena arterialis [pulmonary artery] into the lung for the circulation and mixture with the air in the lung parenchyma. The aerated blood is purified and passes through the artery venalis [pulmonary veins] to reach the left chamber of the two that the heart possesses after being mixed with the air and made suitable for the evolution of the animal spirit."*

The Koran prevented him from conducting human anatomical research, so Nafis had to use deduction. In his text, he not only manifests an attitude contrary to the dogmatism of his time, evidencing a renovating spirit typical of the already close Renaissance, but also a practical activity by developing comparative anatomy for his observations. The authority that **Avicenna** enjoyed at that time made it necessary to have an unfaltering courage of the intellect, to rectify his opinions.

Apparently written around 1245, its existence only became known in 1924, through a chance finding by a medical student in the Cairo Library, making it known in the "*Inaugural Dissertation*" at the University of Freiburg in Breisgau (1924). Several existing manuscripts are currently known in Paris, Damascus, Berlin and Spain, four of them being found in El Escorial.

Ibn an-Nafis died in 1288. It is said that, close to his death, a disciple brought him an alcoholic beverage. The author of the first writing on the minor circulation rejected this offer with the following words: "*I do not want to present myself to my Creator with wine in*

*my body*". Nafis's description of the minor blood circulation was much earlier than the following accounts made on the same subject by Miguel Serveto (1546), Juan Valverde (1556) and Realdo Colombo (1559). Although these last authors do not mention the Arab doctor, the question remains: did they know his work? We will make, in this regard, some reflections, from the basis of considering Venice as a point of contact at that time between the Western and Eastern civilizations. The commercial exchange was frequent and therefore the cultural manifestations were permeated in both directions. Venice, with this contribution, enriched its economy and its art.

It was precisely a Venetian, Andrés Alpago (born around 1450), graduated from the University of Padua, who was appointed doctor to the Venetian consul in Damascus around 1487. A prolonged stay of 30 years in those lands allowed him to translate Arabic works and soak up their medicine. Upon returning to his hometown, he edited Avicenna's "*Canon*" in Latin, published in 1527 after his death in 1521. Although the discovery of Ibn an-Nafis is not mentioned in that text, nor is there any other documentation in this regard, it is very probable that Andrés Alpago knew the ideas of the Arab doctor. The fact that Alpago was appointed to the Padua Chair, although he was unable to take over as professor due to his death, denotes a relationship with the anatomists of that University. At that time, Realdo Colombo and Juan Valverde, the former as a professor at the Faculty of Padua around 1543 and the second, a disciple of Colombo in Pisa in 1545, probably had information about such findings, and later made it known, although without specifying the transfer from the East.