Ibn Al-Nafis

Forgotten Arab genius?

– Written by Michael Hamilton Morgan, USA

There is probably no one who better illustrates the sometimes tragic misunderstandings in the 1400 year relationship between the West and the Arab-Muslim world, than Ibn al-Nafis, the first recorded discoverer of how the blood circulates from heart to lungs and back again, exchanging waste carbon dioxide for life-giving oxygen.

The misunderstandings he personifies are many. For example, he is a 'poster boy' for those who believe the Arab world for centuries seeded European discovery and invention and then was discredited as Europe rose to dominate the globe and rewrite the narrative of scientific discovery. He is a powerful denial of the Orientalist 'refrigerator theory' – debunked by George Saliba at Columbia University: i.e. that Arab Muslim science was too religiously constrained to actually invent anything, but only preserved Greco-Roman thought and then enabled its translation into Europe, where a more secular and open society used it to spark the Renaissance.

Al-Nafis disproves the Western belief that increasing conservatism in 13th century Sunni Islam ended Islamic scientific and medical invention at that time. And finally he reminds the modern world of the forgotten mechanism of how medieval translations of Arabic manuscripts into European tongues moved ideas from Golden Age Islam into Dark Age and medieval Europe.

Looked at another way, how did al-Nafis' discoveries trickle into Europe for 400 years, yet lay buried in a German archive until 1936 CE, so that he didn't receive Western credit for his discovery which went instead to William Harvey in 1628? Why did al-Nafis suffer one more forgotten breakthrough by an Arab fully 4 centuries before the European 're-discovery', comparable to Ibn Sina's word association and talk therapy predating Sigmund Freud by 800 years, or al-Jahiz' theory of natural selection predating Darwin by 1000, or Ibn al-Haytham's early 11th century forgotten work on optics enabling Copernicus' discovery of the earth's orbit of the sun in the 17th century?

Now to the facts. Al-Nafis, known for most of his life as Ala al-Din Abu al-Hassan Ali Ibn Abi-Hazm al-Qarshi al-Dimashqi, was born in Damascus in the year 1213 and did his medical studies at the Bimaristan al-Noori – even as the world was traumatised by the relentless western advance of the Mongol forces of Genghis Khan. This century-long military holocaust displaced and killed millions of people, destroyed the royal city of Baghdad and destabilised other rich and ancient cities in Persia, Afghanistan and elsewhere in Eurasia.

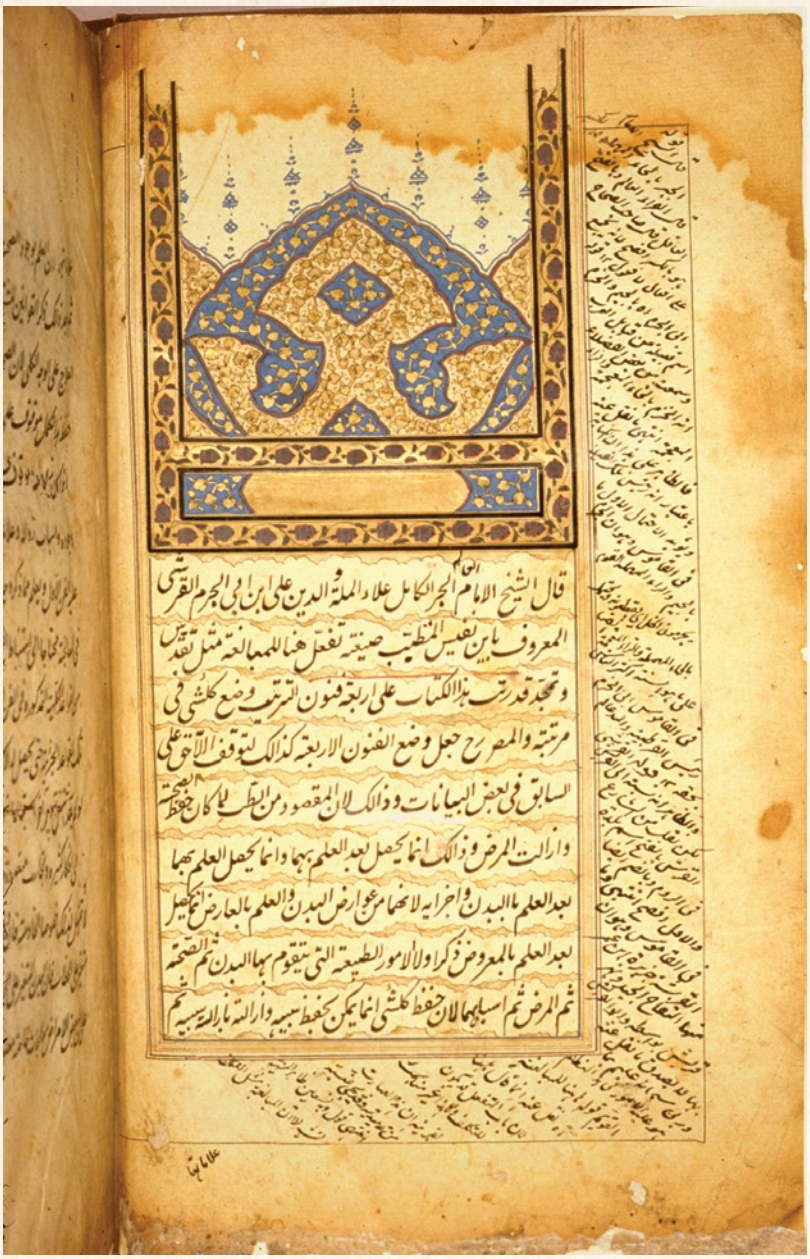

Image: The opening page of one of Ibn al-Nafis's medical works. This is probably a copy made in India during the 17th or 18th century. PD-Old-100 Wikimedia Commons.

But the Arab resistance finally took hold in Syria and Egypt, and so Damascus and Cairo were spared the horrors of the Mongols, enabling those two cities and their intellectual refugees from the east to reach even greater heights of achievement, replacing the role of fallen Baghdad.

In 1236 at the age of 23, al-Nafis followed his schoolmate Usaibi'a (a future historian and biographer) and moved to Cairo where he first worked at the Al-Nassri Hospital and subsequently at the Al-Mansouri Hospital. He even became Mansouri's physician-in-chief. Mansouri Hospital was one the most advanced in the world, in a city reaching its true zenith of power, wealth and influence. Al-Nafis may have been personal physician to Mamluk Sultan al-Zahir Baybars al-Bunduqdari.

There are many unanswered questions about al-Nafis. The earliest one centres around his Syrian companion Usaibi'a, who would become a respected historian and who wrote extensively about his times and the many medical leaders and thinkers he knew. But Usaibi'a never once mentions al-Nafis. Beirut scholars Haddad and Khairallah speculated in 1936[1] that there was some altercation between the two at Al Mansouri, or that Usaibi'a was jealous of his schoolmate's genius and so erased him from history.

Like his equally-mysterious fellow immigrant-genius Ibn al-Haytham – father of modern optics, who had adopted Cairo as his new home after leaving Iraq – Ibn al-Nafis was an orthodox Muslim. Like his fellow Muslim polymaths, al-Nafis wrote across multiple disciplines, including astronomy, theology, Islamic law and even sociology. He even wrote perhaps the Arabic language's first science fiction novel, Theologus Autodidactus, about a child raised on a desert island who later comes into contact with the larger world.

To understand the man and his work, one should have a fairly clear understanding of the religious context in which he worked, and also how his own religious beliefs shaped his work in the mid- and late-1200s CE. Conventional Western views depict that time as one of rising conservatism in Sunni Islam, explained in part by al-Ghazali's reaction against Hellenistic thought, the Crusades, the disappearance of the Fatimids and the Mongol invasion. All these things, in the eyes of Western historians like Bernard Lewis, were the death knell of the Golden Age of Islam and the end of Arab Muslim scientific invention. That someone like al-Nafis could do his work at that time seems to these observers accidental or an anomaly.

Put another way, much has been made at a distance of 1000 years about the supposed fatal clash of the schools of reason and revelation in Islam and how that influenced the rise and fall of Muslim science and discovery in the period 800 to 1700 CE.

There is no doubt that there was a difference of opinion about how to interpret religious text. But there was no stark dividing line, particularly for devout and brilliant thinkers like Ibn al-Haytham, al-Kindi, al-Tusi and of course al-Nafis.

There was a spectrum, from the most literalist, to the most interpretative and cosmopolitan. But fiercely inventive thinkers like al-Nafis and Ibn al-Haytham, though they were devout, were scientific free-thinkers. They saw no conflict between

being devout and being scientists who took no scientific or medical theory on faith.

According to Nahyan Fancy in his PhD dissertation at Notre Dame[2], Al-Nafis was somewhere in the middle of the reason vs revelation poles and had no problem working there. What he did not do was to let literal sacred text deter him from scientific reality. As with Ibn al-Haytham, he believed that a scientist's role was to uncover the truth of God's creation in all its forms by direct examination, not by taking scientific or medical fact on faith or on the basis of sacred text.

But he devoutly followed religious rules and practices. According to Haddad and Khairallah, on his deathbed al-Nafis reportedly refused wine to ease his pain and he was reported to have voiced the common belief that the Mongol invasion was sent by Allah to punish the Muslims for adopting the decadent ways of Persia and other older civilisations.

At the youthful age of 29, in the year 1242 CE, al-Nafis published his Commentary on Anatomy in Avicenna's Canon, containing his revolutionary thoughts on heart-lung blood circulation. But to make his discovery, al-Nafis had to overthrow a theory of circulation created by Galen, the venerable Greco-Roman father of medicine from the 2nd century CE, that had stood unchallenged for nearly 1000 years. Even Ibn Sina accepted Galen's views on blood circulation without question.

Historians of science now know the Greeks, masterminds of geometry and world-class philosophy and the seeds of representative democracy, often failed at certain basics of empirical science. They were too much caught up in their imaginative theories and hypotheses that went untested by scientific verification.

One key example is Ptolemy's explanation of light and vision. Ptolemy theorised that light was a ray that emerged from the eyeball and illuminated the object being looked at. This now seems odd and absurd, but like Galen's theory of circulation, it stood unchallenged for about 1000 years, until Ibn al-Haytham proved that light came from a light source, struck the object and was reflected back to the eye that saw it.

Now imagine what al-Nafis had to contend with, to undo Galen's views. The first obstacle was a long standing unquestioning reverence for Galen that most Arab Muslim physicians had adopted; one exception was 9th century Baghdad physician al-Razi, in his 'Doubts about Galen'.

A second and just as formidable obstacle, was a general aversion to dissection and vivisection in the 13th century world. Al-Nafis is very noncommittal about whether he practiced dissection. But he, or someone close to him, must have.

Al-Nafis was ready to put Galen to the test. He knew that Galen and the millennium of physicians who followed him had been intrigued at how the carbon dioxide-rich blue-tinted blood in the veins somehow became red. No one had any idea of the gases in the blood that caused these two colours. Ibn Sina and others attributed the colour changes to 'spirit' and 'life force'.

To explain movement of the blood from the heart to lungs and back, Galen had theorised that there was a porous membrane between the left and right ventricles that let the blood pass through and begin its journey again. Galen hypothesised this sometime in the late 2nd or early 3rd century CE.

There was no evidence of these pores, but because Galen saw no other explanation, they 'had' to be there.

This is very similar to 2nd century CE Greek scholar Claudius Ptolemy's equant, a very complicated mathematical formula used to explain the otherwise baffling movements of planets and stars across the sky in a geocentric universe. The huge error here was Ptolemy's mistaken belief that the earth was at the center of the solar system.

Galen was guilty of the same Greek failing: un-scientific attachment to his unproven hypothesis about blood.

As medical scholar John B. West points out in a 2008 article in the Journal of Applied Physiology[3], al-Nafis' Commentary made three key revisions to Galen, (using a translation by Max Meyerhof):

- "...but there is no passage between these two cavities [right and left ventricles]; for the substance of the heart is solid in this region and has neither a visible passage, as was thought by some persons, nor an invisible one which could have permitted the transmission of blood, as was alleged by Galen. The pores of the heart there are closed and its substance is thick."

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- "...the blood after it has been refined in this cavity [right ventricle], must be transmitted to the left cavity where the [vital] spirit is generated...For the penetration of the blood into the left ventricle is from the lung, after it has been heated within the right ventricle and risen from it, as we stated before."
- Al Nafis' final breakthrough was his educated guess that there was some small blood flow between the pulmonary vein and artery. He apparently did not prove that categorically, leaving it to Italian Marcello Malpighi four centuries later, during Harvey's time: "And for the same reason there exists perceptible passages (or pores, manafidh) between the two [blood vessels, namely pulmonary artery and pulmonary vein]".

Al-Nafis lived until 1288. It took Europe three more centuries to catch up with al-Nafis' discoveries about heart-lung blood circulation, but when it did, it took his advances even higher. Al-Nafis and his discoveries were unacknowledged by modern Western science until 1936.

Michael Servetus (or Miguel Servet, 1511 to 1553) was the first European to voice similar theories. This very brave and often unpopular free-thinker from Spain threw himself into the midst of incendiary Protestant-Catholic religious fights in Italy, France and Switzerland, and was burned at the stake with all his writings in Geneva. His biggest crimes: he rejected the Christian doctrine of the Trinity and the rite of baptism, managing to offend both the Catholic Church and reformer John Calvin. There are suggestions he may have read the Qu'ran. There is no proof that he read Ibn al-Nafis' Commentary in any language. As a daring, free-thinking medical researcher and dissector, it is possible he may have discovered the correct blood circulation entirely on his own.

Servetus' writings may have influenced one Realdus Columbus, as well as Servetus' student Juan Valverde (ca.1525 to 1587) and possibly Belgian Andreas Vesalius. But did Servetus influence William Harvey?

Realdus Columbus was born in Cremona, Italy, son of a druggist and lived from 1516 to 1559. He studied medicine and he too voiced theories identical to al-Nafis and Servetus. Could he have learned of al-Nafis' discovery from manuscripts in Italy or elsewhere – perhaps a wandering and now-lost medieval translation by Gerard of Cremona coming out of Spain and back to his native Cremona? No documentary proof exists.

Andreas Vesalius was Brussels-born but ended up as a medical professor at the University of Padua. He predates Harvey by about 100 years. He was an extensive dissector and also echoed the circulation theories of al-Nafis, Servetus and the others, whether borrowed from them or independently discovered.

Finally, William Harvey of England also studied at the University of Padua from 1599 to 1602 and graduated as a doctor of medicine. He then returned north and eventually became the King's Physician. Among other projects, he was even sent to investigate women accused of witchcraft, but became a total skeptic as to whether witches existed.

In the more liberal medical atmosphere of his time he was able to carry out significant dissections. In great clinical detail, he brought Ibn al-Nafis' theories to their highest articulation. Western medical history credits him with the discovery of the correct circulation of blood from heart to lung, which he formally published to great acclaim in Frankfurt in 1628 CE.

Now the story is at an end and the 400-year journey of ideas from Ibn al-Nafis to William Harvey is complete.

So: Did Harvey get his ideas from al-Nafis?

The final answer is buried in time. The best one can prove is that these Arab ideas were circulating north through various channels and also arising independently, that Italy was a key point for European medical innovation; and all of the players had residence or ties to Cremona or Padua or elsewhere in Italy.

The most sceptical statement as to whether Harvey was explicitly drawing on al-Nafis comes from medical scholar John B. West in a 2008 article in the Journal of Applied Physiology[3]. He sees a possible link between Ibn al-Nafis and Michael Servetus – but he casts doubt on whether Servetus influenced Harvey in turn, because Servetus and most of his writings were burned with him at the stake for his ideas and Harvey probably never saw Servetus' work.

But the circumstantial evidence for a direct link is certainly intriguing: multiple translators and thinkers bringing some of al-Nafis' ideas into Renaissance Italy and Spain.

Until more manuscripts are discovered, the brilliant al-Nafis will remain a figure of mystery. Why did his historian friend Usaibi'a go into exile and never mention him? And why is there no record of his most important discovery – the correct circulation of blood – coming explicitly into Europe, when other of his lesser writings did go north and west?

The answer may yet await researchers in the dusty archives of Cairo, Damascus, Toledo, Belluno, Padua or even Germany.

Until then, the world must be content to marvel at one more visionary Arab Muslim genius, centuries ahead of his time, who dared to see the future from a misunderstood past now receding into forgetfulness.

Further reading

1. *Haddad SI, Khairallah AA. A forgotten chapter in the history of the circulation of the blood. Ann Surg 1936; 104:1-8.*
2. *Fancy NAG. Pulmonary transit and bodily resurrection: the interaction of medicine, philosophy and religion in the works of Ibn Al-Nafis (D. 1288). PhD Thesis. University of Notre Dame, 2006.*
3. *West JB. Ibn al-Nafis, the pulmonary circulation, and the Islamic Golden Age. J Appl Physiol 2008; 105:1877-1880.*
4. *Morgan MH. Lost History: the Enduring Legacy of Muslim Scientists, Thinkers and Artists. Washington DC: National Geographic Books/Random House 2007.*

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